...rgia
264.3
.A55

NASA SP-7011 (155)

AEROSPACE MEDICINE AND BIOLOGY

THE UNIVERSITY OF MICHIGAN
JUL 19 1976
ENGINEERING LIBRARY

A CONTINUING BIBLIOGRAPHY

WITH INDEXES

(Supplement 155)

JUNE 1976

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

ACCESSION NUMBER RANGES

Accession numbers cited in this Supplement fall within the following ranges:

STAR (N-10000 Series)	N76-18039—N76-20061
IAA (A-10000 Series)	A76-22404—A76-25757

This bibliography was prepared by the NASA Scientific and Technical Information Facility operated for the National Aeronautics and Space Administration by Informatics Information Systems Company.

NASA SP-7011 (155)

AEROSPACE MEDICINE AND BIOLOGY

A CONTINUING BIBLIOGRAPHY WITH INDEXES

(Supplement 155)

A selection of annotated references to unclassified reports and journal articles that were introduced into the NASA scientific and technical information system and announced in May 1976 in

- *Scientific and Technical Aerospace Reports (STAR)*
- *International Aerospace Abstracts (IAA).*

Scientific and Technical Information Office
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
Washington, D.C.
JUNE 1976

NASA SP-7011 and its supplements are available from the National Technical Information Service (NTIS). Questions on the availability of the predecessor publications, Aerospace Medicine and Biology (Volumes I - XI) should be directed to NTIS.

This Supplement is available from the National Technical Information Service (NTIS), Springfield, Virginia 22161, for $4.00. For copies mailed to addresses outside the United States, add $2.50 per copy for handling and postage.

INTRODUCTION

This Supplement to *Aerospace Medicine and Biology* (NASA SP-7011) lists 173 reports, articles and other documents announced during May 1976 in *Scientific and Technical Aerospace Reports (STAR)* or in *International Aerospace Abstracts (IAA)*. The first issue of the bibliography was published in July 1964; since that time, monthly supplements have been issued.

In its subject coverage, *Aerospace Medicine and Biology* concentrates on the biological, physiological, psychological, and environmental effects to which man is subjected during and following simulated or actual flight in the earth's atmosphere or in interplanetary space. References describing similar effects of biological organisms of lower order are also included. Such related topics as sanitary problems, pharmacology, toxicology, safety and survival, life support systems, exobiology, and personnel factors receive appropriate attention. In general, emphasis is placed on applied research, but references to fundamental studies and theoretical principles related to experimental development also qualify for inclusion.

Each entry in the bibliography consists of a bibliographic citation accompanied in most cases by an abstract. The listing of the entries is arranged in two major sections: *IAA Entries* and *STAR Entries*, in that order. The citations, and abstracts when available, are reproduced exactly as they appeared originally in *IAA* or *STAR*, including the original accession numbers from the respective announcement journals. This procedure, which saves time and money, accounts for the slight variation in citation appearances.

Two indexes—subject and personal author—are included.

An annual index will be prepared at the end of the calendar year covering all documents listed in the 1976 Supplements.

AVAILABILITY OF CITED PUBLICATIONS

IAA ENTRIES (A76-10000 Series)

All publications abstracted in this Section are available from the Technical Information Service, American Institute of Aeronautics and Astronautics, Inc. (AIAA), as follows: Paper copies are available at $5.00 per document up to a maximum of 20 pages. The charge for each additional page is 25 cents. Microfiche[1] are available at the rate of $1.50 per microfiche for documents identified by the # symbol following the accession number. A number of publications, because of their special characteristics, are available only for reference in the AIAA Technical Information Service Library. Minimum airmail postage to foreign countries is $1.00. Please refer to the accession number, e.g., (A76-13400), when requesting publications.

STAR ENTRIES (N76-10000 Series)

One or more sources from which a document announced in *STAR* is available to the public is ordinarily given on the last line of the citation. The most commonly indicated sources and their acronyms or abbreviations are listed below. If the publication is available from a source other than those listed, the publisher and his address will be displayed on the availability line or in combination with the corporate source line.

Avail: NTIS. Sold by the National Technical Information Service to U.S. customers at the price shown in the citation following the letters HC (hard, paper, or facsimile copy). Customers outside the U.S. should add $2.50 per copy for handling and postage charges to the price shown. (Prices shown in earlier *STAR* volumes, 1962-1975, have been superseded but may be calculated from the number of pages shown in the citation. The price schedule by page count was published in *STAR* Numbers 2 and 3 of 1976, or it may be obtained from NTIS.)

Microfiche[1] is available at a standard price of $2.25 (plus $1.50 for non-U.S. customers) regardless of source or the quality of the fiche, for those accessions followed by a # symbol. Accession numbers followed by a + sign are not available as microfiche because of size or reproducibility.

Initially distributed microfiche under the NTIS SRIM (Selected Research in Microfiche) is available at greatly reduced unit prices. For this service and for information concerning subscription to NASA printed reports, consult the NTIS Subscription Unit.

NOTE ON ORDERING DOCUMENTS: When ordering NASA publications (those followed by the * symbol), use the N accession number. NASA patent applications (only the specifications are offered) should be ordered by the US-Patent-Appl-SN number. Non-NASA publications (no asterisk) should be ordered by the AD, PB, or other *report* number shown on the last line of the citation, not by the N accession number. It is also advisable to cite the title and other bibliographic identification.

Avail: SOD (or GPO). Sold by the Superintendent of Documents, U.S. Government Printing Office, in hard copy. The current price and order number are given following the availability line. (NTIS will fill microfiche requests, at the standard $2.25 price, for those documents identified by a # symbol.)

(1) A microfiche is a transparent sheet of film, 105 by 148 mm in size, containing as many as 60 to 98 pages of information reduced to micro images (not to exceed 26:1 reduction).

Avail: NASA Public Document Rooms. Documents so indicated may be examined at or purchased from the National Aeronautics and Space Administration, Public Documents Room (Room 126), 600 Independence Ave., S.W., Washington, D.C. 20546, or public document rooms located at each of the NASA research centers, the NASA Space Technology Laboratories, and the NASA Pasadena Office at the Jet Propulsion Laboratory.

Avail: ERDA Depository Libraries. Organizations in U.S. cities and abroad that maintain collections of Energy Research and Development Administration reports, usually in microfiche form, are listed in *Nuclear Science Abstracts*. Services available from the ERDA and its depositories are described in a booklet, *Science Information Available from the Energy Research and Development Administration* (TID-4550), which may be obtained without charge from the ERDA Technical Information Center.

Avail: Univ. Microfilms. Documents so indicated are dissertations selected from *Dissertation Abstracts* and are sold by University Microfilms as xerographic copy (HC) at $10.00 each and microfilm at $4.00 each regardless of the length of the manuscript. Handling and shipping charges are additional. All requests should cite the author and the Order Number as they appear in the citation.

Avail: USGS. Originals of many reports from the U.S. Geological Survey, which may contain color illustrations, or otherwise may not have the quality of illustrations preserved in the microfiche or facsimile reproduction, may be examined by the public at the libraries of the USGS field offices whose addresses are listed in this Introduction. The libraries may be queried concerning the availability of specific documents and the possible utilization of local copying services, such as color reproduction.

Avail: HMSO. Publications of Her Majesty's Stationery Office are sold in the U.S. by Pendragon House, Inc. (PHI), Redwood City, California. The U.S. price (including a service and mailing charge) is given, or a conversion table may be obtained from PHI.

Avail: BLL (formerly NLL): British Library Lending Division, Boston Spa, Wetherby, Yorkshire, England. Photocopies available from this organization at the price shown. (If none is given, inquiry should be addressed to the BLL.)

Avail: ZLDI. Sold by the Zentralstelle für Luftfahrtdokumentation und -Information, Munich, Federal Republic of Germany, at the price shown in deutschmarks (DM).

Avail: Issuing Activity, or Corporate Author, or no indication of availability. Inquiries as to the availability of these documents should be addressed to the organization shown in the citation as the corporate author of the document.

Avail: U.S. Patent Office. Sold by Commissioner of Patents, U.S. Patent Office, at the standard price of 50 cents each, postage free.

Other availabilities. If the publication is available from a source other than the above, the publisher and his address will be displayed entirely on the availability line or in combination with the corporate author line.

SUBSCRIPTION AVAILABILITY

This publication is available on subscription from the National Technical Information Service (NTIS). The annual subscription rate for the monthly supplements, excluding the annual cumulative index, is $18.75 domestic; $23.50 foreign. All questions relating to the subscriptions should be referred to NTIS.

ADDRESSES OF ORGANIZATIONS

American Institute of Aeronautics and Astronautics
Technical Information Service
750 Third Ave.
New York, N.Y. 10017

British Library Lending Division,
Boston Spa, Wetherby, Yorkshire,
England

Commissioner of Patents
U.S. Patent Office
Washington, D.C. 20231

Energy Research and Development Administration
Technical Information Center
P.O. Box 62
Oak Ridge, Tennessee 37830

ESA - Space Documentation Service
ESRIN
Via Galileo Galilei
00044 Frascati (Rome), Italy.

Her Majesty's Stationery Office
P.O. Box 569, S.E. 1
London, England

NASA Scientific and Technical Information Facility
P.O. Box 8757
B.W.I. Airport, Maryland 21240

National Aeronautics and Space Administration
Scientific and Technical Information Office (KSI)
Washington, D.C. 20546

National Technical Information Service
Springfield, Virginia 22161

Pendragon House, Inc.
899 Broadway Avenue
Redwood City, California 94063

Superintendent of Documents
U.S. Government Printing Office
Washington, D.C. 20402

University Microfilms
A Xerox Company
300 North Zeeb Road
Ann Arbor, Michigan 48106

University Microfilms, Ltd.
Tylers Green
London, England

U.S. Geological Survey
1033 General Services Administration Bldg.
Washington, D.C. 20242

U.S. Geological Survey
601 E. Cedar Avenue
Flagstaff, Arizona 86002

U.S. Geological Survey
345 Middlefield Road
Menlo Park, California 94025

U.S. Geological Survey
Bldg. 25, Denver Federal Center
Denver, Colorado 80225

Zentralstelle für Luftfahrtdokumentation und -Information
8 München 86
Postfach 880
Federal Republic of Germany

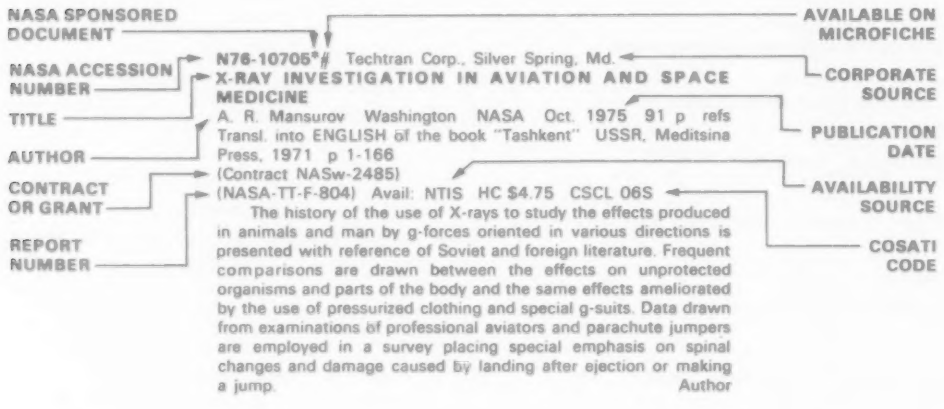
TABLE OF CONTENTS

Page

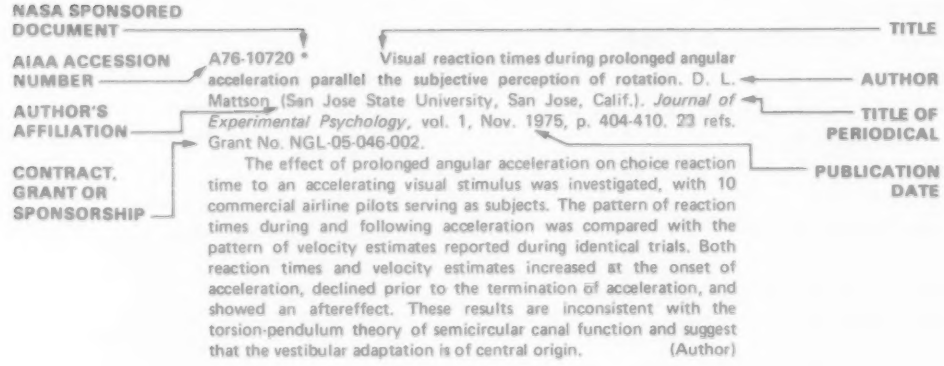
IAA Entries (A76-10000) 117
STAR Entries (N76-10000) 131

Subject Index I-1
Personal Author Index I-19

TYPICAL CITATION AND ABSTRACT FROM *STAR*


NASA SPONSORED DOCUMENT
AVAILABLE ON MICROFICHE
NASA ACCESSION NUMBER
N76-10705*# Techtran Corp., Silver Spring, Md.
CORPORATE SOURCE
TITLE
X-RAY INVESTIGATION IN AVIATION AND SPACE MEDICINE
AUTHOR
A. R. Mansurov Washington NASA Oct. 1975 91 p refs Transl. into ENGLISH of the book "Tashkent" USSR, Meditsina Press, 1971 p 1-166
PUBLICATION DATE
CONTRACT OR GRANT
(Contract NASw-2485)
AVAILABILITY SOURCE
REPORT NUMBER
(NASA-TT-F-804) Avail: NTIS HC $4.75 CSCL 06S
COSATI CODE
The history of the use of X-rays to study the effects produced in animals and man by g-forces oriented in various directions is presented with reference of Soviet and foreign literature. Frequent comparisons are drawn between the effects on unprotected organisms and parts of the body and the same effects ameliorated by the use of pressurized clothing and special g-suits. Data drawn from examinations of professional aviators and parachute jumpers are employed in a survey placing special emphasis on spinal changes and damage caused by landing after ejection or making a jump.
Author

TYPICAL CITATION AND ABSTRACT FROM *IAA*


NASA SPONSORED DOCUMENT
TITLE
AIAA ACCESSION NUMBER
A76-10720 *
Visual reaction times during prolonged angular acceleration parallel the subjective perception of rotation. D. L.
AUTHOR
AUTHOR'S AFFILIATION
Mattson (San Jose State University, San Jose, Calif.). Journal of
TITLE OF PERIODICAL
Experimental Psychology, vol. 1, Nov. 1975, p. 404-410. 23 refs.
CONTRACT, GRANT OR SPONSORSHIP
Grant No. NGL-05-046-002.
PUBLICATION DATE
The effect of prolonged angular acceleration on choice reaction time to an accelerating visual stimulus was investigated, with 10 commercial airline pilots serving as subjects. The pattern of reaction times during and following acceleration was compared with the pattern of velocity estimates reported during identical trials. Both reaction times and velocity estimates increased at the onset of acceleration, declined prior to the termination of acceleration, and showed an aftereffect. These results are inconsistent with the torsion-pendulum theory of semicircular canal function and suggest that the vestibular adaptation is of central origin.
(Author)

AEROSPACE MEDICINE AND BIOLOGY

A Continuing Bibliography (Suppl. 155)

JUNE 1976

IAA ENTRIES

A76-22411 * **Signal dispersion within a hippocampal neural network.** J. M. Horowitz (California, University, Davis, Calif.) and J. W. B. Mates. *(University of California, Biomedical Engineering Symposium, 1st, University of California, Davis, Calif., Sept. 11, 12, 1974.) Computers in Biology and Medicine*, vol. 5, Dec. 1975, p. 283-296. 29 refs. Research supported by the University of California; Grants No. NGR-05-004-099; No. NIH-MH-06686.

A model network is described, representing two neural populations coupled so that one population is inhibited by activity it excites in the other. Parameters and operations within the model represent EPSPs, IPSPs, neural thresholds, conduction delays, background activity and spatial and temporal dispersion of signals passing from one population to the other. Simulations of single-shock and pulse-train driving of the network are presented for various parameter values. Neuronal events from 100 to 300 msec following stimulation are given special consideration in model calculations. (Author)

A76-22412 * **Models of energy metabolism of intact animals - Data tabulations, representation of basal metabolic activities and endocrine effects upon metabolism.** N. E. Smith, L. Ely, R. L. Baldwin, C. Dolkas, L. J. Koong, G. Moberg, and T. Plucinski (California, University, Davis; NASA, Ames Research Center, Moffett Field, Calif.). *(University of California, Biomedical Engineering Symposium, 1st, University of California, Davis, Calif., Sept. 11, 12, 1974.) Computers in Biology and Medicine*, vol. 5, Dec. 1975, p. 315-323. 11 refs. NASA-supported research.

A76-22596 **Effect of external impact on entrance region fluid flow.** X. J. R. Avula and H. L. Oestreicher (USAF, Aerospace Medical Research Laboratory, Wright-Patterson AFB, Ohio). In: Society of Engineering Science, Annual Meeting, 12th, Austin, Tex., October 20-22, 1975, Proceedings. Austin, University of Texas, 1975, p. 1107-1115. 8 refs.

In this study a theoretical account of the flow of blood in the entrance region of an artery subjected to an axial impact is presented. A procedure based on the numerical solution of the momentum-integral equation is used. The unsteady entrance flow rate which is required for the solution is obtained from the linearized Navier-Stokes equations and the knowledge of pressure-time history and impact force. The entrance region velocity profiles and friction forces are calculated. (Author)

A76-22608 * **Evaluating a CRT map predictor for airborne use.** D. L. Baty (NASA, Ames Research Center, Biotechnology Div., Moffett Field, Calif.). *IEEE Transactions on Systems, Man, and Cybernetics*, vol. SMC-6, Mar. 1976, p. 209-215.

Six airline pilots participated in a fixed-base simulator experiment designed to study the advantages and disadvantages of incorporating a simple horizontal flight-path predictor on both fixed and rotating electronic CRT map displays. The pilots were asked to fly a modified 'figure eight' ground track while attempting to maintain constant altitude. All flight information was displayed on one 17-in. (43-cm) CRT monitor. The controlled variables were the map orientation, pilots, presence or absence of crosswinds, presence or absence of wind gusts, and presence or absence of predictor. Error scores were recorded as deviations from the commanded ground track and altitude. It was found that the predictor reduced deviations from the commanded ground track, narrowed performance differences among pilots, narrowed the error differences found with and without crosswinds, and decreased pilot work load. (Author)

A76-22639 **Spectral matrix analysis of steady state visually evoked cortical potentials.** B. Hamel, J. R. Bourne, and J. W. Ward (Vanderbilt University, Nashville, Tenn.). In: Electricity: An expanding technology; Proceedings of the Southeast Region 3 Conference, Charlotte, N.C., April 6-9, 1975. Volume 2. New York, Institute of Electrical and Electronics Engineers, Inc., 1975, p. 5B-4-1 to 5B-4-5. 13 refs. NSF Grant No. GK-42773; Grant No. NIH-72-2211.

A frequency domain technique for the analysis of steady-state Visually Evoked Cortical Potentials (VECPs) is described in this paper. A matrix of power spectra constructed from temporally contiguous segments of the EEG is used to display VECP changes as a photic stimulus, presented to a human observer, is varied from 3 to 12 Hz. Characteristics of the photically driven EEG are examined by calculating estimates of the total spectral power in selected frequency ranges. Examples of differences in the analysis of VECPs recorded from normal subjects and uremic patients are given. (Author)

A76-23136 **EKG signal analysis.** J. J. Uhran, Jr. (Notre Dame, University, Notre Dame, Ind.). In: Modeling and simulation. Volume 6 - Proceedings of the Sixth Annual Pittsburgh Conference, Pittsburgh, Pa., April 24, 25, 1975. Part 1. Pittsburgh, Pa., Instrument Society of America, 1975, p. 369-373. 9 refs.

Autoregressive and moving average time series analysis is applied to the on-line processing of electrocardiographic signals. The output of the electrocardiograph is fed directly through an A/D converter into a digital computer which controls the timing and sampling rate. These data can be stored permanently on disk, punched on cards, or printed on the line printer. A digital filter is used to eliminate 60 cycle hum interference, and an analog filter with a feedback loop is used to eliminate DC drift due to muscle tension and patient movements. Two examples with different parameter spaces are analyzed to indicate how diagnostic pattern recognition might take place: signal analysis with periodicity removed and analysis without periodicity removed. B.J.

A76-23173 # **A technique for totally automated audiometry.** C. R. Meyer and H. C. Sutherland, Jr. (USAF, School of Aerospace Medicine, Brooks AFB, Tex.). *IEEE Transactions on Biomedical Engineering*, vol. BME-23, Mar. 1976, p. 166-168. 10 refs.

The paper outlines the design of an integral audiometer-digital microprocessor called a tone count audiometric computer which is a combination of Hughson-Westlake and tone counting techniques

used in determining hearing threshold levels. The device employs a pseudo-random number generator to generate one through four tones and a dedicated microprocessor to implement the Hughson-Westlake decision tree for each frequency of examination. The benefits of the combination of techniques are deduced from a priori knowledge of the exact testing and scoring methodology involved. In addition, determination of the hearing threshold levels is carried out automatically without external bias. The validity of the resulting hearing threshold level determinations is further increased by the small probability of achieving a low false threshold. Hearing threshold levels from each ear are stored in bipolar memory for external interrogation by technician, automatic data logging device, or computer. S.D.

A76-23252 # **The continuing case for simulator training.** M. J. Dunford (Singer Co. /UK/, Ltd., Link Miles Div., Lancing, Sussex, England). *Aircraft Engineering*, vol. 48, Feb. 1976, p. 11-13.

The paper re-emphasizes the tremendous cost benefit of simulator training as opposed to training in the air, as evidence by comparing the hourly operating cost of certain aircraft and that of their corresponding simulators, but then points out that the area of cost comparison has now shifted, being centered around the costs of one type of simulator complex as against another. The multi-cockpit simulator complex is one cost-efficient means of training a large number of pilots, where the task is basically one of initial, conversion, and continuation training. For full-mission training, the need for individual simulators is evident. Advances in digital radar systems have strongly improved simulation technology with regard to realism and total fidelity. P.T.H.

A76-23426 * **A fine structural study of degenerative-regenerative pathology in the surgically deafferentated lateral vestibular nucleus of the rat.** J. E. Johnson, Jr. (NASA, Ames Research Center, Neurosciences Branch, Moffett Field, Calif.). *Acta Neuropathologica*, vol. 33, 1975, p. 227-243. 50 refs. NASA Task 970-21-11-11.

A76-23442 # **Effect of oxygen on lipid composition and triglyceride-lipase activity in lung tissue.** G. Georgiev, K. Kumanov, N. Khadzhiivanova, R. Mateeva, I. Mindova, Zh. Doncheva, and T. Neicheva (B'lgarska Akademiia na Naukite, Tsentralna Laboratoriia po Biofizika; Akademiia na Selskostopanskite Nauki, Sofia, Bulgaria). *Bolgarskaia Akademiia Nauk, Doklady*, vol. 28, no. 12, 1975, p. 1689-1691. 10 refs.

A76-23443 # **Oxygen influence on phospholipids and their fatty acid composition in lung tissue.** G. Georgiev, G. Dimitrov, K. Kumanov, N. Khadzhiivanova, I. Mindova, Zh. Doncheva, B. Todorov, and T. Neicheva (B'lgarska Akademiia na Naukite, Tsentralna Laboratoriia po Biofizika; Akademiia na Selskostopanskite Nauki, Sofia, Bulgaria). *Bolgarskaia Akademiia Nauk, Doklady*, vol. 28, no. 12, 1975, p. 1693-1695. 6 refs.

A76-23448 **Length of main left coronary artery in relation to atherosclerosis of its branches - A coronary arteriographic study.** N. Gazetopoulos, P. J. Ioannidis, A. Marselos, D. Kelekis, C. Lolas, D. Avgoustakis, and C. Tountas (Aretaeion Hospital; Hippocrateion Hospital, Athens, Greece). *British Heart Journal*, vol. 38, Feb. 1976, p. 180-185. 21 refs.

The relation between the length of the main left coronary artery and the presence of atherosclerosis in its branches or the presence of complete left bundle-branch block was studied by selective coronary arteriography in 43 persons. The length of the main left coronary artery was found to be significantly shorter in patients with coronary atherosclerosis than in subjects without angiographic evidence of coronary artery disease. In patients with electrocardiographic evidence of complete left bundle-branch block, the length of the left main coronary artery was significantly shorter than that in both previous groups. In view of these findings, it is suggested that a short main left coronary artery should be considered as a congenital factor predisposing to the development of coronary artery disease. The possible mechanisms leading to atherosclerosis of the left coronary arterial branches in the presence of a short main trunk are discussed. (Author)

A76-23500 **Detection of cyclic sleep phenomena using instantaneous heart rate.** M. J. Lisenby, P. C. Richardson, and A. J. Welch (Texas, University, Austin, Tex.). *Electroencephalography and Clinical Neurophysiology*, vol. 40, Feb. 1976, p. 169-177. Grant No. DAMD17-74-C-4081.

The investigation reported is concerned with the development of a process for separating rapid eye movement (REM) and non-REM states on the basis of a spectral analysis of the beat-by-beat heart rate. Such a process would make it possible to employ for a detection of individual sleep states an automatic procedure which is based only on the observation of the heart rate. Attention is given to the modeling of phenomena which are characteristic for the majority of subjects. A description is given of a computer-based algorithm for the separation of sleep cycles. The approach used is based on the detection of REM periods which denote the beginning of a cycle. G.R.

A76-23572 **Studies of bio-heat transfer in mammals.** A. Shitzer (Technion - Israel Institute of Technology, Haifa, Israel). In: Topics in transport phenomena: Bioprocesses, mathematical treatment, mechanisms. Washington, D.C., Hemisphere Publishing Corp.; New York, Halsted Press, 1975, p. 211-343. 165 refs.

The thermoregulatory system in mammals is examined, taking into account theories on thermoregulation and the characteristics of thermoregulation in homeotherms, during hibernation, and in pathological states. A description of the thermal behavior of biological media is presented and analytical bio-heat transfer studies are discussed. Attention is given to mathematical models for single elements of the organism, countercurrent heat exchange in blood vessels, localized heat sources (sinks), some applications of heat transfer in medicine, the determination of blood perfusion, thermographic and infrared studies, thermal interaction with external devices, and respiratory heat transfer. G.R.

A76-23743 **Brain wave components of the contingent negative variation in humans.** J. W. Rohrbaugh, K. Syndulko, and D. B. Lindsley (California, University, Los Angeles, Calif.). *Science*, vol. 191, Mar. 12, 1976, p. 1055-1057. 16 refs. Grant No. PHS-NS-8552.

In a contingent negative variation paradigm with two stimuli paired at an interstimulus interval of 4 seconds, two distinct waveforms having functional and topographic differences are observed. An early wave is maximal over the frontal cortex and is elicited by the warning stimulus. A later wave, maximal over the motor cortex, precedes the imperative stimulus and is identified with preparation for motor response. (Author)

A76-23799 * **Studies on human urinary arylamidases.** P. N. Raina (NASA, Ames Research Center, Biomedical Research Div., Moffett Field, Calif.; Government Medical College, Srinagar, India) and S. Ellis (NASA, Ames Research Center, Biomedical Research Div., Moffett Field, Calif.). *Archives Internationales de Physiologie et de Biochimie*, vol. 83, 1975, p. 519-528. 30 refs.

Human urinary protein was found to contain enzymes that hydrolyze leucyl-, alanyl-, and glycyl-prolyl-beta-naphthylamides. The kinetic constants of these enzymes were determined and their chemical properties studied. The pH optima for the hydrolysis of the various naphthylamides were also determined. Glycyl-prolyl-arylaminade was inhibited by Co(2+) and Mn(2+), while two other arylamidases were slightly activated by Co(2+). p-Chloromercuriphenyl-sulfonate and puromycin significantly inhibited leucyl and alanyl arylamidases. The mean values for 24-hour urinary output for

leucyl-, alanyl-, and glycyl-prolyl arylamidases in normal human male subjects were 4.32, 9.97, and 2.2 units, respectively. P.T.H.

A76-23842 # **Interhemispheric interaction during perception of visual stimuli in man (Mezhpolusharnoe vzaimodeistvie u cheloveka pri vospriiatii zritel'nykh stimulov).** E. A. Kostandov and O. A. Genkina (Tsentral'nyi Nauchno-Issledovatel'skii Institut Sudebnoi Psikhiatrii, Moscow, USSR). *Zhurnal Vysshei Nervnoi Deiatel'nosti*, vol. 25, Sept.-Oct. 1975, p. 899-907. 15 refs. In Russian.

A76-23843 # **Analysis of interhemispheric relationships in the visual cortex of the cat on the basis of the law of contrast light perception (Analiz mezhpolusharnykh vzaimootnoshenii v zritel'noi kore koshek na osnovanii zakona kontrastnogo vospriiatiia sveta).** V. L. Bianki and V. A. Kurochkin (Leningradskii Gosudarstvennyi Universitet, Leningrad, USSR). *Zhurnal Vysshei Nervnoi Deiatel'nosti*, vol. 25, Sept.-Oct. 1975, p. 1061-1067. 8 refs. In Russian.

A76-23844 # **Neural activity of the hippocampus in certain types of behavior (Aktivnost' neironov gippokampa pri nekotorykh vidakh povedeniia).** B. I. Kotliar, N. O. Timofeeva, and I. I. Semikopnaia (Moskovskii Gosudarstvennyi Universitet, Moscow, USSR). *Zhurnal Vysshei Nervnoi Deiatel'nosti*, vol. 25, Nov.-Dec. 1975, p. 1258-1265. 24 refs. In Russian.

Experiments were conducted to study the impulse activity of 87 neurons and EEG of the hippocampus (area CA1) during calm and active wakefulness, and at different stages of sleep in unrestrained rabbits with implanted microelectrodes. A correlation is established between the character of impulse activity, EEG, and the behavior involved. During transition from sleep to wakefulness, 63.3% of the neurons were activated while 29.1% were inhibited. The neurons activated during arousal reduced the impulse activity of the hippocampus during deep sleep and enhanced discharge frequency during the paradoxical phase of sleep; whereas the inhibited neurons revealed a reverse dynamics of discharge frequency. Changes in the impulse activity in the state of wakefulness for different types of behavior are discussed. It is suggested that the role of the hippocampus in the manifestation of behavioral responses is determined by its participation in creating a specific neutral tonus level in the brain cortex for each state. S.D.

A76-23998 # **—The effect of vibration on the electrical activity of arm muscles (Vliianie vibratsii na elektricheskuiu aktivnost' myshts ruki).** A. S. Meliia (Gruzinskii Gosudarstvennyi Institut Fizicheskoi Kultury, Tiflis, Georgian SSR) and M. V. Khvingiia (Akademiia Nauk Gruzinskoi SSR, Institut Mekhaniki Mashin, Tiflis, Georgian SSR). *Akademiia Nauk Gruzinskoi SSR, Soobshcheniia*, vol. 79, Sept. 1975, p. 697-700. 9 refs. In Russian.

Mechanical oscillations of the shoulder and forearm were induced by transmission of vibrations at frequencies up to 200 Hz and amplitudes up to 1 mm through the hand on the freely lowered strained arm. The biological currents of the shoulder and forearm were recorded. Maximum oscillations of the shoulder and minimum oscillations of the forearm occurred at the forced frequency of 30 Hz; biological currents appeared synchronously at forced frequencies up to 50 Hz. Results indicate that in the strained arm there is a redistribution of rigidity in the forearm-shoulder system such that most or all of the vibration is focused in the shoulder. C.K.D.

A76-24102 # **Coordination between a digital computer and a human operator (Soglasovanie ETsVM s chelovekom-operatorom).** Iu. I. Zozulia. *Problemy Bioniki*, no. 15, 1975, p. 12-18. 9 refs. In Russian.

It has become necessary to automate the work expended by a human operator on the coordination of his brain functions with those of a digital computer by interfacing the man/machine system with special-purpose matching devices which ensure data input and output in the form of visual and acoustic signals natural for the human operator. In order to secure a considerable amount of operational memory in such matching devices, it is necessary to provide them with the structural-functional organization of the brain neuron network and realize them as neuron-like computing media (NCMs) consisting of monotypic universal neuron-like elements, thereby assuring high adaptability to industrial production and high operational reliability. A classification is given of NCMs along with associated technical tools necessary for realizing the transformation of a set of input signals into a set of output signals of NCM. S.D.

A76-24105 # **Simulation of human operator activity with allowance for the characteristics of his operational memory (Modelirovanie deiatel'nosti cheloveka-operatora s uchetom kharakteristik operativnoi pamiati).** B. A. Smirnov. *Problemy Bioniki*, no. 15, 1975, p. 33-40. 5 refs. In Russian.

An algorithm is proposed for simulating the activity of a human operator, taking into account the characteristics of his operational memory involved in a complex man/machine system requiring the use of immediate human operational memory. Distribution laws are employed to describe these characteristics regarded as random variables. A computer simulation of human operator activity is carried out, and simulation results are presented. S.D.

A76-24106 # **Minimization of encoded synchronous and asynchronous biopotentials of the brain. II (Minimizatsiia zakodirovannykh sinkhronnykh i asinkhronnykh potentsialov golovnogo mozga. II).** G. A. Kolotenko. *Problemy Bioniki*, no. 15, 1975, p. 45-51. In Russian.

Certain aspects of the problem concerning the modeling of synchronous and asynchronous biopotentials of the brain are analyzed using the formalism of Boolean algebra. The technical realization of the system of quantitative analysis of the electrical activity of the brain on the basis of logical elements is discussed. A number of characteristics pertaining to the analysis of biopotentials are elucidated. These characteristics make it possible to reveal the set of temporal relationships among the recorded brain structures and to determine the instability of the models which reflect the functional state of the brain. S.D.

A76-24150 **Relationship of the magnetoencephalogram to the electroencephalogram - Normal wake and sleep activity.** J. R. Hughes, D. E. Hendrix, J. Cohen (Northwestern University Medical Center, Chicago, Ill.), F. H. Duffy, H. L. Scholl (Harvard University; Massachusetts General Hospital, Boston, Mass.), C. I. Mayman (Harvard University; Beth Israel Hospital, Boston, Mass.), and B. N. Cuffin (MIT, Cambridge, Mass.). *Electroencephalography and Clinical Neurophysiology*, vol. 40, Mar. 1976, p. 261-278. 21 refs. Research supported by the Department of Mental Health of the State of Illinois.

Characteristics of the magnetoencephalogram (MEG) are described, with particular emphasis on the relationship of this new type of recording brain activity to some waking and sleep patterns of the EEG in five male and two female subjects without known disease. Similarities and differences in simultaneously recorded MEG and EEG during wakefulness and sleep are discussed, especially with reference to the dipole orientation of various types of activity. Alpha frequencies phase reversals are seen in the relationship of EEG with MEG from opposite sides of the head. The results stress the dissociation between MEG and EEG when slow waves are recorded. During sleep stages I and II the correlation between MEG and EEG is primarily for alpha activity present during wakefulness, but not during sleep. The most common rhythm in MEG is theta activity, especially at 4-5 per sec. In comparison with alpha activity during wakefulness, sleep spindles are relatively poorly represented in MEG as are vertex shape waves. S.D.

A76-24170 # **Measurement of the radiation dose absorbed in outer space from the solar flare on August 4, 1972 (Izmerenie**

pogloshchtennoi dozy radiatsii ot solnechnoi vspyshki 4 Avgusta 1972 g. v otkrytom kosmose). O. I. Savun and A. I. Sladkova. *Kosmicheskie Issledovaniia*, vol. 14, Jan.-Feb. 1976, p. 135-140. 18 refs. In Russian.

The dose of proton radiation absorbed in outer space by the two Prognos satellites as the result of the solar flare of August 4, 1972 was measured from ionization chamber data obtained under conditions of varying amounts of protection. The level of radiation grew to about 1,000 times the normal background level, attaining a maximum value of 16 rad/hour. The Prognos data are used together with data from Explorer-41 and Explorer-43 to calculate the tissue dose at a depth of 5 cm. The radiation dose at this level is shown to be about 8% of the maximum dose. C.K.D.

A76-24197 # **The effect of low intensity millimetric radiation on the gamma resonance of the hemoglobin spectrum (Vliianie millimetrovogo izlucheniia maloi intensivnosti na gamma-rezonansnye spektry gemoglobina).** N. D. Deviatkov, V. V. Kharpov, R. E. Garibov, V. A. Kudriashova, V. I. Gaiduk, G. F. Bakaushina, A. M. Khrapko, A. A. Levina, and A. P. Andreeva (Akademiia Nauk SSSR, Institut Radiotekhniki i Elektroniki; Akademiia Meditsinskikh Nauk SSSR, Moscow, USSR). *Akademiia Nauk SSSR, Doklady*, vol. 225, Dec. 1, 1975, p. 962-965. 11 refs. In Russian.

A76-24198 # **The relationship of vitamin A to protein synthesis in animals under normal conditions and under the influence of ionizing radiation (Ob otnoshenii vitamina A k biosintezu belka v organizme zhivotnykh v norme i pri deistvii ioniziruiushchei radiatsii).** K. M. Leutskii, M. M. Baran, and A. F. Batsura (Chernovitskii Gosudarstvennyi Universitet, Chernovtsy, Ukrainian SSR). *Akademiia Nauk SSSR, Doklady*, vol. 225, Dec. 1, 1975, p. 969, 970. 11 refs. In Russian.

A76-24199 # **Morphogenesis of the early stages of the restoration of hemopoiesis in the spleen of irradiated mice following bone marrow transplant (Morfogenez rannikh etapov vosstanovleniio gemopoeza v selezenke obluchennykh myshei posle transplatatsii kostnogo mozga).** M. M. Nezdatnyi and K. K. Zaitseva (Voenno-Meditsinskaia Akademiia, Leningrad, USSR). *Akademiia Nauk SSSR, Doklady*, vol. 225, Dec. 1, 1975, p. 981-984. 5 refs. In Russian.

A76-24200 * **Thermoregulatory responses of restrained versus unrestrained rabbits.** G. N. McEwen, Jr. (NASA, Ames Research Center, Moffett Field, Calif.). *Life Sciences*, vol. 17, no. 6, 1975, p. 901-905. 16 refs. NSF Grant No. GB-13797.

A76-24206 # **Effect of ionizing electromagnetic radiation on DNA in solution and on white blood cells (Deistvie ioniziruiushchikh elektromagnitnykh izluchenii na DNK v rastvore i na belye kletki krovi).** M. I. Sukhoviia, A. V. Koval'chuk, and E. N. Trifonov (Uzhgorodskii Gosudarstvennyi Universitet, Uzhgorod, Ukrainian SSR). *Akademiia Nauk SSSR, Doklady*, vol. 225, Dec. 11, 1975, p. 1202-1205. 11 refs. In Russian.

The effect of X-rays of various energies and bremsstrahlung gamma quanta from a betatron on DNA in aqueous solutions and on leukocyte cell structures was studied experimentally. The relative biological effectiveness (RBE) of the radiation was estimated by the concentration of defects it brought about in the secondary DNA structure (molecular test) and by the effective destruction time of leukocytes (cell test). Results are presented in the form of kinetic curves and their linear anamorphoses and the fusion curves for control samples and DNA irradiated by various doses. The time for 50% dehelixization decreases with increased dose level; irradiated DNA is sharply contrasted with initial DNA in that fusion of its structure takes place at lower temperatures. For all types of radiation, the dependence of concentration defects on dose level was linear and that of time for destruction of 50% of leukocytes was logarithmic. The RBE values determined through the molecular and cell tests correlated well, and the types of radiation in order of descending RBE were: 180-kV X-rays, 40-kV X-rays, and gamma quanta of maximum energy 25 MeV. P.T.H.

A76-24207 # **Specific changes in the energetics of myocardial contraction under the influence of thyroxin (O spetsificheskikh izmeneniiakh energetiki sokrashchenii miokarda pod vliianiem tiroksina).** Iu. S. Aliukhin and K. P. Ivanov (Akademiia Nauk SSSR, Institut Fiziologii, Leningrad, USSR). *Akademiia Nauk SSSR, Doklady*, vol. 225, Dec. 11, 1975, p. 1228-1231. 9 refs. In Russian.

The changes in myocardial energetics under the influence of thyroxin were studied by measuring the efficiency - determined as the ratio of the external mechanical work of the left ventricular muscle to the total heart energy expenditure - of the isolated heart of white rats injected with regular doses of thyroxin over various extended periods of time. The specific effect of thyroxin was found to consist in a lowering of efficiency, with the result that at the same level of work the energy expenditure and heat production of the myocardium increases. This suggests that during adaptation of an organism to cold, the injection of hormones by the thyroid gland is one of the mechanisms for regulating the energetics of myocardial contractions in the direction of higher heat release. P.T.H.

A76-24216 # **New data on the circadian rhythmicity of wakefulness and sleep in vertebrates (Novye dannye o tsirkadnoi bioritmike bodrstvovaniia i sna u pozvonochnykh).** I. G. Karmanova (Akademiia Nauk SSSR, Institut Evoliutsionnoi Fiziologii i Biokhimii, Leningrad, USSR). *Akademiia Nauk SSSR, Doklady*, vol. 225, Dec. 21, 1975, p. 1457-1460. 9 refs. In Russian.

Physiograph and visual observations are analyzed to investigate circadian rhythms in the wakefulness and sleep of various fish, amphibians, reptiles, and birds. Results indicate the universality of cyclic periods of wakefulness and rest. Differences in the length and character of the observed periods of wakefulness and rest indicate that circadian rhythms changed over the course of evolution. Patterns of wakefulness and rest are separated into three stages of increasing complexity. The daytime rest observed in some fish and amphibians and termed 'presleep' is the most primitive level, followed by the slightly more highly adapted nocturnal presleep characteristic of other vertebrates of these types. The second stage is characterized by nocturnal rest in the form of sleep. At the third stage sleep patterns increase in complexity. C.K.D.

A76-24217 # **The significance of efferent regulation of carotid labyrinth chemoreceptors in maintaining their stability (Znachenie efferentnoi reguliatsii khemoretseptorov karotidnogo labirinta v obespechenii ikh ustoichivosti).** V. O. Samoilov and G. M. Cherniakov (Voenno-Meditsinskaia Akademiia, Leningrad, USSR). *Akademiia Nauk SSSR, Doklady*, vol. 225, Dec. 21, 1975, p. 1461-1463. 6 refs. In Russian.

A76-24225 # **Blood flow rate in the capillaries of the brain cortex /from microcinematographic data/ (Skorost' krovotoka v kapilliarakh kory golovnogo mozga /po dannym mikrokinos'emki/).** M. K. Kalinina, Iu. I. Levkovich, K. P. Ivanov, and V. K. Trusova (Akademiia Nauk SSSR, Institut Fiziologii, Leningrad, USSR). *Akademiia Nauk SSSR, Doklady*, vol. 226, Jan. 1, 1976, p. 230-233. 8 refs. In Russian.

A76-24232 # **On the physiological activity of the nuclear apparatus of the vascular epithelial cells of the human brain at various ages (O fiziologicheskoi aktivnosti iadryshkovogo apparata epitelial'nykh kletok sosudistykh spletenii golovnogo mozga cheloveka v vozrastnom aspekte).** F. Kh. Sharipov and V. I. Pol'skii (Tadzhikskii Gosudarstvennyi Meditsinskii Institut, Dyushambe, Tadzhik SSR). *Akademiia Nauk Tadzhikskoi SSR, Doklady*, vol. 18, no. 8, 1975, p. 57-60. 6 refs. In Russian.

A76-24241 # **Criteria for the collocation of instruments in the cockpit (Kryteria rozmieszczania przyrzadow w kabinie zalogi).** T. Smolicz. *Technika Lotnicza i Astronautyczna*, vol. 31, Feb. 1976, p. 20-22. In Polish.

The paper gives a brief discussion of ergonomic considerations in the collocation of instruments in the cockpit. Three zones of

information, characterized by certain angular ranges of attention, are defined and characterized according to their ease of perception. The principle of maximum information for a minimum attention path is illustrated on the example of the cockpit of the Il-62 aircraft. Attention is called to the need for a unified language for communication from the machine - the aircraft - to man. P.T.H.

A76-24245 **Enzyme activities in hepatic venous blood under strenuous physical exercise.** E. Fojt (Slaska Akademia Medyczna, Katowice, Poland), L.-G. Ekelund (Karolinska Institutet, Stockholm, Sweden), and E. Hultman (Beckomberga Sjukhus, Bromma, Sweden). *Pflügers Archiv*, vol. 361, no. 3, 1976, p. 287-296. 52 refs. Research supported by the Swedish Medical Research Council. SMRC Project B74-03X-2467-06B.

An investigation was conducted of the effects of physical exercise on liver function. The investigation was undertaken to study the possibility that exhausting physical exercise may injure the liver. Experiments were performed with six male volunteers. It was found that during intensive physical exercise some specific enzymes are released from the splanchnic area into the blood. A relative hypoxia in liver and muscle could be the reason for the enzyme release. The effect of liver hypoxia could lead to liver cell damage. G.R.

A76-24260 **Microbial cryptobiosis and recycling - A conservation mechanism in evolution.** J. C. Deelman (Laboratorium für Sedimentforschung, Heidelberg, West Germany) and J. C. M. De Coo (Universiti Kebangsaan Malaysia, Kuala Lumpun Federation of Malaysia). *Modern Geology*, vol. 5, Nov. 1975, p. 185-189. 23 refs.

Preparation of Devonian calcispheres abundantly present in certain fine grained limestone samples gave rise to speculations on a possible revival of the spore-like fossils from a dormant, or cryptobiotic, state. Although no sterilisation of the rock samples, or of the equipment used took place, nor was the preparation onto glass slides performed under sterile conditions, direct microscopic observation of budding spores does not suggest contamination as the source of the phenomenon. Whatever value of observations may be attributed, theoretical consequences of a similar process in nature could be discussed. Microbial cryptobiosis capable of withstanding lithification of sediments and revival upon weathering of the rock would deliver retarded individual microorganisms into their favourable environment. Those microbes that possess an exchange of genetic information by way of meiosis would receive an injection of old, non-evolved genes. Prokaryotic microorganisms would receive among them living fossils, and if the related organisms would have evolved to a certain degree, will constitute a separate species. Cryptobiotic capacity might explain some cases of conservation of certain organisms during evolution. (Author)

A76-24268 **Perceived orientation in depth from line-of-sight movement.** R. V. Slocum (Saint Francis College, Fort Wayne, Ind.) and W. A. Hershberger (Northern Illinois University, De Kalb, Ill.). *Perception and Psychophysics*, vol. 19, no. 2, Feb. 1976, p. 176-182. 10 refs. Grant No. PHS-5-R01-EY-00979-02.

Twelve college students viewed computer-generated displays of a cross comprised of two orthogonal dotted lines, and judged the apparent in-depth orientation of the horizontal arm. The vertical arm of the simulated cross was always in the observer's frontal plane, but the randomly textured horizontal arm was in one of nine orientations relative to the line of sight. Each observer viewed displays in which the simulated cross was alternatively stationary, approaching the viewer, and stationary but expanding in size. The static texture density gradient mediated perceived orientation in depth. When motion perspective was added to the detail perspective, the impression of depth was enhanced, with the greatest enhancement obtaining at the near viewing distance. When dynamic magnification was added to the detail perspective, the impression of depth was attenuated; this effect was interpreted as an illusory case of motion perspective. (Author)

A76-24279 **The human factor and the automation of ATC systems (Der Faktor Mensch bei der Automation von FS-Systemen).** R. Seifert (Messerschmitt-Bölkow-Blohm GmbH, Ottobrunn, West Germany). *Ortung und Navigation*, no. 4, 1975, p. 77, 79-86. In German.

A review is presented of a talk given by Hopkin at a meeting of the AGARD in May 1975. The talk provided an outline of certain problems related to the development of ATC systems. These problems involve questions of human engineering concerning the appropriate employment of the human element in the ATC system. In addition to the review, an evaluation is given of the position of the controller in partly automated ATC systems. Problems concerning the design of currently existing systems are often related to a lack of cooperation between the human engineer and the systems engineer who writes the device specifications. In an investigation of the feasibility of a completely automated ATC system, it is concluded that such a system cannot be implemented within the next 30 years. Attention is given to functional assignments and control capacity in the case of a partially automated system. G.R.

A76-24396 # **Subsidiary signals in ergatic systems (Dopomizhni signali v ergatichnikh sistemakh).** A. M. Meleshev and V. V. Pavlov. *Avtomatika*, Nov.-Dec. 1975, p. 40-43. In Ukrainian.

Control systems are considered in which a man plays part of a sensing device, setting inputs to inner circuit of the system. For a special kind of input signal coming to indicator which is operated by a man it is expedient to introduce an additional signal to the input of the system. In this case the quality of the whole ergatic system operation improves. The results of the experiments are given. (Author)

A76-24723 * **On the substrate specificity of cathepsins B1 and B2 including a new fluorogenic substrate for cathepsin B1.** J. K. McDonald and S. Ellis (NASA, Ames Research Center, Biomedical Research Div., Moffett Field, Calif.). *Life Sciences*, vol. 17, no. 8, 1975, p. 1269-1276. 25 refs.

A76-24750 **In space - Of mice and men (Dans l'espace - des souris et des hommes).** A. Dupas. *La Recherche*, vol. 7, Mar. 1976, p. 265-268. 11 refs. In French.

Two approaches to the investigation of the physiological effects of long-term exposure to a space environment, space biology and space medicine, are discussed. Major results of studies carried out by the biosatellites Cosmos-605 and Cosmos-690 are summarized. Physiological changes observed in white mice subjected to prolonged weightlessness have been found to be completely reversible, disappearing within 15 days of return to earth. Studies of two generations of Drosophila melanogaster hatched in space have indicated no morphological modifications or increases in the rate of genetic mutation. It was found that animals irradiated while in space display more severe pathological modifications than those subjected to identical radiation doses on earth. Experiments to be included in Cosmos-782, designed to study the effects of artificial gravity on biological specimens, are described. The process of adaptation of the human body to prolonged weightlessness is discussed in the light of observations carried out during Skylab and Salyut missions. C.K.D.

A76-24775 **Left ventricular end-diastolic pressure volume relationships with experimental acute global ischemia.** I. Palacios, R. A. Johnson, J. B. Newell, and W. J. Powell, Jr. (Massachusetts General Hospital; Harvard University, Boston, Mass.). *Circulation*, vol. 53, Mar. 1976, p. 428-436. 18 refs. Research supported by the Universidad Central de Venezuela; Grants No. PHS-1-P17-HL-17665; No. NIH-HL-5196; No. NIH-HL-06664; No. NIH-N01-HV-71443; No. NIH-N01-HV-53002.

The mechanism of elevation of left ventricular end-diastolic pressure during acute global ischemia was evaluated by examination of the relative contributions of a decrease in contractility and an alteration of the pressure-volume relationship. The external circumference pressure relationship, as an index of the pressure-volume

relationship, was studied in beta adrenergic and ganglionic blocked, open chest dogs on right heart bypass at constant heart rate and aortic pressure. Ischemia of one and two hours' duration was produced by reducing total coronary blood flow in cannulated left and right coronary arteries until left ventricular end-diastolic pressure rose significantly. Ischemia produced a marked depression of ventricular function: stroke work. Neither ischemia nor reflow changed the pressure-volume relationship. Thus, the elevation of left ventricular end-diastolic pressure during ischemia in an otherwise normal canine myocardium is due to a decrease in systolic performance of the heart rather than to an alteration of the pressure-volume relationship. (Author)

A76-24919 # **System for automating laboratory experiments in medical-biological studies (Sistema avtomatizatsii laboratornykh eksperimentov v mediko-biologicheskikh issledovaniiakh).** B. N. Malinovskii, V. M. Egipko, I. A. Pogosian, V. B. Reutov, A. T. Mizerniuk, and V. I. Mashkin (Akademiia Nauk Ukrainskoi SSR, Institut Kibernetiki, Kiev, Ukrainian SSR). *Upravliaiushchie Sistemy i Mashiny,* Nov.-Dec. 1975, p. 126-132. 5 refs. In Russian.

The automatic test system described in this paper is intended for experimentation in the following fields: electrophysiology, bioacoustics, motor performance, hemodynamics, the nervous system, psychophysiology, biochemical analysis, analysis of biological spectra, geometrical studies in biology, biocontrol, and therapeutic procedures. The automatic system, on the lower level, is devoted to experimental design algorithms, control of experiments, automatic acquisition and recording of data, primary data processing, speedy analysis of data in the course of experimentation, readout of intermediate and final results in a form convenient for the experimenter and data transmission to the higher level. The higher level is devoted to the coordination of the subsystems of the lower level, input of control signals to these subsystems, processing of large quantities of data, statistical analysis of data from series of experiments, computation of complex algorithms of experimental design and creation of links with other automatic test systems. B.J.

A76-24922 # **The problem of multiply related regulation of respiratory indices /pH, pO2, pCO2/ of the human organism (Problema mnogosviaznoi reguliatsii dykhatel'nykh pokazatelei /pH, pO2, pCO2/ organizma).** E. A. Iumatov (I Moskovskii Meditsinskii Institut, Moscow, USSR). *Uspekhi Fiziologicheskikh Nauk,* vol. 6, Oct.-Dec. 1975, p. 34-64. 119 refs. In Russian.

The activity of the functional system of respiration involving a complex of functionally related anatomical structures for the autoregulation of the respiratory indices /pH, pO2, pCO2/ of the human organism is analyzed on the basis of an overview of numerous published data along with a systematic investigation of the dynamics of regulation of the respiratory indices in the arterial blood, cerebrospinal fluid, and the tissue of the respiratory center for different O2-CO2 regimes. It is concluded that the functional system of respiration constitutes a multivariable system due to the fact that its activity is simultaneously directed toward the regulation of several multiply related humoral indices /pH, pO2, pCO2/. This means that in the functional system of respiration, the end result is represented by the set of its constituent parameters. S.D.

A76-24923 # **Critical remarks on the theory of 'set-point' in thermoregulation (Kriticheskie zamechaniia k teorii 'ustanovochnoi tochki' v termoreguliatsii).** V. A. Bernshtein (Institut Fizkul'tury, Malakhovka, USSR). *Uspekhi Fiziologicheskikh Nauk,* vol. 6, Oct.-Dec. 1975, p. 124-133. 32 refs. In Russian.

The 'set-point' concept proposed by Hammel is thought of as the level of internal (hypothalamic) temperature of the body at which there is no noticeable compensatory reaction of temperature control and the level is considered optimal under given conditions. The contradictions of the set-point theory are disclosed by analyzing the mechanisms of working hyperthermy and a few other thermoregulatory shifts in the body. Two independent concepts are proposed instead of the single term set-point. The first concept is referred to as the 'nonreactive level' of internal (hypothalamic) temperature at which there is noticeable compensatory reaction of thermoregulation. The second concept is that of an 'optimal level' of internal temperature, which is most favorable for the principal functions of the body under specified conditions. Both levels may shift when necessary, independently of one another. S.D.

A76-25078 * **A perceptual channel for information transfer over kilometer distances - Historical perspective and recent research.** H. E. Puthoff and R. Targ (Stanford Research Institute, Menlo Park, Calif.). *IEEE, Proceedings,* vol. 64, Mar. 1976, p. 329-354. 81 refs. Research supported by the Foundation for Parasensory Investigation, Parapsychology Foundation, and Institute of Noetic Sciences; Contract No. NAS7-100.

For more than 100 years, scientists have attempted to determine the truth or falsity of claims for the existence of a perceptual channel whereby certain individuals are able to perceive and describe remote data not presented to any known sense. This paper presents an outline of the history of scientific inquiry into such so-called paranormal perception and surveys the current state of the art in parapsychological research in the United States and abroad. The nature of this perceptual channel is examined in a series of experiments carried out in the Electronics and Bioengineering Laboratory of Stanford Research Institute. The perceptual modality most extensively investigated is the ability of both experienced subjects and inexperienced volunteers to view, by innate mental processes, remote geographical or technical targets including buildings, roads, and laboratory apparatus. The accumulated data indicate that the phenomenon is not a sensitive function of distance, and Faraday cage shielding does not in any apparent way degrade the quality and accuracy of perception. On the basis of this research, some areas of physics are suggested from which a description or explanation of the phenomenon could be forthcoming. (Author)

A76-25169 # **Changes in the very slow potentials of the human brain in daytime sleep with rapid eye movements (Variatsii v sverkhmedlennykh potentsialakh golovnogo mozga cheloveka v dnevnom sne s bystrymi dvizheniiami glaz).** N. A. Aladzhalova (Akademiia Meditsinskikh Nauk SSSR, Moscow, USSR) and M. Kh. Mikaelian (Akademiia Nauk Armianskoi SSR, Institut Eksperimental'noi Biologii, Yerevan, Armenian SSR). *Fiziologiia Cheloveka,* vol. 1, July-Aug. 1975, p. 610-616. 17 refs. In Russian.

A76-25170 # **Development dynamics of response to light flash in the occipital region of the cerebral cortex in man as a function of the type of background alpha activity (Dinamika razvitiia reaktsii na vspyshku sveta v zatylochnoi oblasti kory golovnogo mozga cheloveka v zavisimosti ot tipa fonovoi al'fa-aktivnosti).** F. Ia. Zolotarev (Ministerstvo Sotsial'nogo Obespecheniia RSFSR, Institut Ekspertizy Trudosposobnosti i Organizatsii Truda Invalidov, Leningrad, USSR). *Fiziologiia Cheloveka,* vol. 1, July-Aug. 1975, p. 617-624. 19 refs. In Russian.

A76-25171 # **Some standard characteristics of electroencephalographic response to hyperventilation /from data on frequency and correlation analysis/ (Nekotorye normativnye kharakteristiki elektroentsefalograficheskoi reaktsii na giperventiliatsiiu /po dannym chastotnogo i korreliatsionnogo analiza/).** D. A. Ginzburg and E. K. Kolomeer (Moskovskii Oblastnoi Nauchno-Issledovatel'skii Klinicheskii Institut, Moscow, USSR). *Fiziologiia Cheloveka,* vol. 1, July-Aug. 1975, p. 625-631. 39 refs. In Russian.

A76-25172 # **Evaluation of physical working capacity (Opredelenie fizicheskoi rabotosposobnosti).** T. M. Voevodina, A. N. Korzhavin, Iu. N. Kupriashin, and S. I. Tarasov (Ministerstvo Zdravookhraneniia RSFSR, Leningradskii Nauchno-Issledovatel'skii Institut Radiatsionnoi Gigieny, Leningrad, USSR). *Fiziologiia Cheloveka,* vol. 1, July-Aug. 1975, p. 684-691. 8 refs. In Russian.

Analysis of published data and the authors' own findings indicates that evaluation of human capacity for physical work by the

currently used tests PWC(170) and maximal oxygen consumption is not sufficiently objective. It is proposed to determine physical working capacity according to the total number of heartbeats above rest level (heart value) and the total oxygen consumption above rest level (energy value), which can be estimated during continuous recording of the cardiac rhythm and oxygen consumption during exercise. Data on the amount of work done as well as on the heart and energy values make it possible to calculate the amount of oxygen consumed per unit work (K1), the number of systoles per unit work (K2), and oxygen pulse (rho) defined as the amount of oxygen consumed per systole, determined by the ratio K1/K2. In some cases, 1/K1 appears to be the most convenient index which characterizes the amount of work done per unit heart value. S.D.

A76-25173 # **Influence of subjective system of coordinates on spatial-motor orientation of the hand (Vliianie sub'ektivnoi sistemy koordinat na prostranstvenno-dvigatel'nuiu orientirovku ruki).** B. B. Bokhov and B. V. Elatomtsev (Institut Mediko-Biologicheskikh Problem, Moscow, USSR). *Fiziologiia Cheloveka*, vol. 1, July-Aug. 1975, p. 697-702. 17 refs. In Russian.

An experiment is conducted to study the relationship between the sensory and motor orientation of the human hand in the case where the visual field is inclined at an angle of 19 and 30 deg to the gravity vector. The function of perceiving the gravity vertical was examined using the test of an illuminated line rotated by a motor in conjunction with the test of vertical writing performed directly by the hand. The index of hand orientation is represented by the position of the major axis of the resulting scattering ellipse. The experiment lasted 100 min and consisted of four periods: the first and fourth were under illumination, while the second and third were under dark adaptation. The results obtained corroborate the working hypothesis that in a situation involving sensory conflict, the spatial-motor orientation of the hand is accomplished in conformity with the individual's dominant visual system of coordinates. S.D.

A76-25259 **Air operations and circadian performance rhythms.** K. E. Klein, H. M. Wegmann, G. Athanassenas, H. Hohlweck, and P. Kuklinski (Deutsche Forschungs- und Versuchsanstalt für Luft- und Raumfahrt, Institut für Flugmedizin, Bad Godesberg, West Germany). *Aviation, Space and Environmental Medicine*, vol. 47, Mar. 1976, p. 221-230. 61 refs. Research supported by the Bundesministerium der Verteidigung, Bundesministerium für Verkehr, and Deutsche Lufthansa; Contract No. F33615-70-C-1598.

Data collected in four different transmeridian flight experiments are presented. The subjects used in the experiments included German fighter pilots, American students, and German students. The characteristics of the normal circadian performance rhythm are examined, taking into account the shape of the curve and the range of oscillation of circadian variation. The rhythm-modifying factors considered include disposition, practice, motivation, personality, change of the sleep-wake cycle, and environmental time cues. Circadian performance rhythms after transmeridian flights are discussed, and attention is given to approaches for reducing the effects of the behavioral circadian rhythm upon crew performance. G.R.

A76-25260 **Determination of regional pulmonary mechanics using a scintillation camera.** R. C. Brown (Cutter Labs, Inc., Berkeley, Calif.), G. J. Trezek (California, University, Berkeley, Calif.), and R. J. Fallot (Pacific Medical Center, San Francisco, Calif.). *Aviation, Space and Environmental Medicine*, vol. 47, Mar. 1976, p. 231-237. 8 refs. Grant No. PHS-NS-08236-05.

Ten subjects with differing degrees of pulmonary function have been studied to determine the regional distribution of volume and flow. A two-lobe electrical analog lung model was used to determine proximal and distal resistances and compliances for the right and left lung. Total flow-volume curves for all 10 subjects are presented in a graph. In the more severely diseased cases flow tends to peak earlier in the vital capacity but at a much lower value. G.R.

A76-25261 **Physiological index as an aid in developing airline pilot scheduling patterns.** S. R. Mohler (FAA, Office of Aviation Medicine, Washington, D.C.). *Aviation, Space and Environmental Medicine*, vol. 47, Mar. 1976, p. 238-247. 10 refs.

A multiplicative and additive formula has been developed for assisting in the development of schedules for airline pilots and flight engineers. The formula is based on freshness/tiredness data derived from aircrews on world flights. It should materially assist those who develop the schedules to avoid, where possible, finalizing those crew patterns that would impose a severe physiologic load on cockpit personnel. The objective of the application of the formula is to assure that crew members retain adequate 'physiologic reserve' in the course of flying various segments of a pattern. This enables them to absorb the stresses of schedule delays or disruptions, as well as unforeseen operational problems and flight emergencies. (Author)

A76-25262 **Ethnic variations in psychological performance under altitude stress.** V. M. Sharma and M. S. Malhotra (Defence Institute of Psychology and Allied Sciences, Delhi, India). *Aviation, Space and Environmental Medicine*, vol. 47, Mar. 1976, p. 248-251. 14 refs.

The investigation reported is concerned with differences in altitude-stress tolerance shown by soldiers drawn from Madras, Rajput, and Gorkha regiments. The subjects were initially tested at Delhi (altitude 200 m) and then brought to a location in the Western Himalayas at an altitude of 4000 m. After 10 months' stay at this location the subjects were tested again. It was found that Gorkhas maintained a reasonably consistent standard concerning the psychological parameters tested. In case of the Madrasis, a marked deterioration was observed. The Rajputs were the most affected of the three ethnic groups. G.R.

A76-25263 **Effects of increased pressures of oxygen and air on short-term memory in mice.** R. T. Truitt (Indiana University, Fort Wayne, Ind.) and S. F. Gottlieb (Purdue University, Fort Wayne, Ind.). *Aviation, Space and Environmental Medicine*, vol. 47, Mar. 1976, p. 258-260. 8 refs.

The purpose of this study was to determine the effects of increased oxygen tensions on short-term memory in mice following one-trial, passive-avoidance learning. Neither increased oxygen tensions per se nor 6 ATA air had any measurable deleterious effects on retention of the learned task. Interference with memory of the learned task occurred only when the animals were subjected to oxygen-induced convulsions. Oxygen-induced convulsions did not result in permanent brain damage such that the animals were incapable of learning. Oxygen-induced convulsions following a 2-h interval after learning did not result in a retrograde amnesia. It appears that oxygen-induced convulsions interferes with the consolidation process of memory. (Author)

A76-25264 **Changes in pulmonary volumes with relocation to 1,600 m following acute translocation to 4,300 m.** J. G. Dramise, C. F. Consolazio, and H. L. Johnson (U.S. Army, Letterman Army Institute of Research, San Francisco, Calif.). *Aviation, Space and Environmental Medicine*, vol. 47, Mar. 1976, p. 261-264. 13 refs.

An investigation was conducted with twelve male volunteers who were acclimatized to 1600 m. Pulmonary and acid-base values were obtained over consecutive periods, first in Denver (1600 m), then during a sojourn on Pike's Peak (4300 m), and finally following relocation from Pike's Peak to Denver. The data obtained in the investigation indicate that reacclimation to low altitude, following a sojourn at high altitude, may require an interval as long as 3 days for some body functions. G.R.

A76-25265 **Head and neck cooling by air, water, or air plus water in hyperthermia.** A. T. Kissen, W. C. Summers, W. J. Buehring, M. Alexander (USAF, Aerospace Medical Research Laboratory, Wright-Patterson AFB, Ohio), and D. C. Smedley (Systems

Research Laboratories, Inc., Dayton, Ohio). *Aviation, Space and Environmental Medicine*, vol. 47, Mar. 1976, p. 265-271. 18 refs. USAF-sponsored research.

The effects of air, water, and air plus water head cooling on thermoregulatory responses and human operator performance were studied in nonacclimatized, heat-exposed men. Forty chamber exposures (46 C, 30 mm Hg water vapor pressure) were conducted under noncooled and the aforementioned subconditions of head cooling. Five subjects, exposed for 80 min, were monitored for mean skin and rectal temperatures, heart rate, sweat loss, and compensatory tracking performance. A modified Air Force helmet shell provided facial air ventilation (24 C) at 8 cfm. Eight interconnected neoprene modules fastened beneath a helmet liner provided water cooling (20 C at 0.9 l/min). Tracking performance was unchanged across conditions. Elevation of rectal temperature and heart rate, sweat loss, and Physiological Index of Strain were significantly reduced by each condition of head cooling. Air is as effective as water as a cooling agent. Air ventilation acts synergistically with water cooling in reducing physiological strain. Relative merits of each approach to head cooling, in an operational context, are discussed. (Author)

A76-25266 * **Survivorship and gene frequencies of Drosophila melanogaster populations in abnormal oxygen atmospheres.** G. P. Kloek, D. B. Ralin, and G. C. Ridgel (Kentucky State University, Frankfort, Ky.). *Aviation, Space and Environmental Medicine*, vol. 47, Mar. 1976, p. 272-279. 33 refs. Grant No. NsG-10-00801.

A76-25267 **Heat stroke - A review.** S. Shibolet (Heller Institute of Clinical Research, Tel-Hashomer, Israel), M. C. Lancaster (Igilov Municipal Hospital, Tel Aviv, Israel), and Y. Danon (USAF, School of Aerospace Medicine, Brooks AFB, Tex.). *Aviation, Space and Environmental Medicine*, vol. 47, Mar. 1976, p. 280-301. 270 refs. Grant No. PHS-06-501-1,79.

Heat stroke is caused by extreme elevation of body temperature. Its occurrence has been observed particularly in connection with the performance of strenuous physical exercise under hot environmental conditions. The physiopathology of heat stroke is considered along with experimental studies of the influence of high temperatures on the living organism. It is pointed out that the pathologic picture is represented by degenerative changes and hemorrhages. A description of the clinical picture is given, taking into account prodromal signs, the central nervous system, hemostasis, the cardiovascular system, lungs, the renal system, water and electrolytes, and the endocrine system. Attention is also given to diagnosis, treatment, and prevention. G.R.

A76-25268 **Vestibular habituation in flightcrew.** P. Pialoux, P. Fontelle, P. Courtin, A. Gibert, P. Robert, P. Blanc, and E. Lafontaine (Centre d'Expertise du Personnel Navigant; Compagnie Nationale Air France, Paris, France). *Aviation, Space and Environmental Medicine*, vol. 47, Mar. 1976, p. 302-307. 41 refs.

The physiological process of habituation is characterized by a progressive diminution of the response to repeated identical stimuli. The main characteristics of vestibular habituation are related to acquisition, retention, loss or dishabituation, and transfer. In a study of flight crew members with different experience levels nystagmographic recordings were made and damped pendular stimulations were applied. Attempts are discussed to reproduce the phenomenon of inversion of the preponderance of total left tremor frequency over total right tremor frequency. G.R.

A76-25269 **Hearing under stress. III - The effect of external auditory meatal pressure on speech discrimination.** G. L. Whitehead, A. M. Rubin, W. H. Johnson, and D. P. Bryce (Toronto, University, Toronto, Canada). *Aviation, Space and Environmental Medicine*, vol. 47, Mar. 1976, p. 308, 309. 7 refs. Defence Research Board of Canada Grant No. 931-126.

It has been well established that unequal air pressure across the tympanic membrane causes an increase in puretone thresholds. Very little information is available, however, concerning concommitant effects on reception and discrimination of speech material. This study was designed to determine whether or not further detrimental effects upon the communication process might occur in the form of decreased speech discrimination ability. The findings established that a high positive pressure in the external meatus can result in a deterioration of the individual's ability to discriminate speech sounds. (Author)

A76-25270 # **Prolonged visual loss and bradycardia following deceleration from +6 Gz acceleration - A case report.** J. S. Kirkland and J. A. Kennealy (USAF, Aerospace Medical Research Laboratory, Wright-Patterson AFB, Ohio). *Aviation, Space and Environmental Medicine*, vol. 47, Mar. 1976, p. 310, 311. 5 refs. USAF-sponsored research.

During deceleration after an acceleration period in a test conducted with human volunteer subjects, one subject experienced a bradycardia and a complete visual loss which persisted for approximately 90 seconds. A careful evaluation of the subject revealed no residual abnormality following the incident. Possible explanations for this phenomenon are discussed. It is pointed out that the marked bradycardia and associated hypotension at the cerebral-eye level (in the order of 25 mm Hg) might explain the lack of retinal perfusion. G.R.

A76-25271 **Electronic stethoscope with frequency shaping and infrasonic recording capabilities.** E. S. Gordon and J. M. Lagerwerff (Lockheed Missiles and Space Co., Inc., Sunnyvale, Calif.). *Aviation, Space and Environmental Medicine*, vol. 47, Mar. 1976, p. 312-316. 5 refs.

A small electronic stethoscope with variable frequency response characteristics has been developed for aerospace and research applications. The system includes a specially designed piezoelectric pickup and amplifier with an overall frequency response from 0.7 to 5000 Hz (-3 dB points) and selective bass and treble boost or cut of up to 15 dB. A steep slope, high pass filter can be switched in for ordinary clinical auscultation without overload distortion from strong infrasonic signal inputs. A commercial stethoscope type headset, selected for best overall response, is used which can adequately handle up to 100 mW of audio power delivered from the amplifier. The active components of the amplifier consist of only four opamp-type integrated circuits. (Author)

A76-25453 # **Redundancy and compatibility in choice-reaction situations with advance information (Redundanz und Kompatibilität in Wahlreaktions-Situationen mit Voranzeigen).** M. Huttenlocher, München, Technische Universität, Fachbereich Wirtschafts- und Sozialwissenschaften, Doktor der Philosophie Dissertation, 1975. 152 p. 70 refs. In German.

The investigation reported is related to an experiment with occasional false information conducted by Leonard (1954). The studies are concerned with the effects of advance information regarding an event on the performance shown in the response to this event. It is assumed that the provided information is only partly correct. The advance information offered combines, therefore, the two aspects of perceptual anticipation considered by Poulton (1952). Attention is given to reaction time and signal probability, reaction time and sequential redundancy, reaction time and compatibility, and the interstimulus interval and reaction time. G.R.

A76-25454 **Fibrinolytic and hemostatic changes during and after maximal exercise in males.** G. L. Davis, C. F. Abildgaard, E. M. Bernauer, and M. Britton (California, University, Davis, Calif.). *Journal of Applied Physiology*, vol. 40, Mar. 1976, p. 287-292. 34 refs. Research supported by the John A. Hartford Foundation; Contract No. F44620-72-C-0011.

The fribrinolytic and hemostatic changes in 10 healthy male

subjects aged 22-27 yr were measured during and after a progressively incremented exercise to maximum on a bicycle ergometer. The relationship of these changes to the degree of physiological work, as indicated by percent heart rate, is discussed. Little change in fibrinolytic activity is observed before 70-80% maximum heart rate (MHR). Major changes in factor VIII are observed between 95 and 100% MHR. An increase in leucocyte count, platelet count, and retention is observed at maximal exercise. Results indicate that expressing the data as a function of the individual's percent heart rate offers a convenient yet valid means of assessing the physiological variables, regardless of physical fitness and age. S.D.

A76-25455 * **Effects of water immersion to the neck on pulmonary circulation and tissue volume in man.** R. Begin, M. Epstein, M. A. Sackner, R. Levinson, R. Dougherty, and D. Duncan (Mount Sinai Medical Center, Miami Beach; U.S. Veterans Administration Hospital, Miami, Fla.). *Journal of Applied Physiology*, vol. 40, Mar. 1976, p. 293-299. 40 refs. Research supported by the U.S. Veterans Administration; Contract No. F4160974-C; Grant No. NGR-10-007-097.

A rapid noninvasive breathing method is used to obtain serial measurements of the pulmonary capillary blood flow, diffusing capacity per unit of alveolar volume, combined pulmonary tissue plus capillary volume, functional residual capacity, and oxygen consumption in five normal subjects undergoing 6 h of sitting, 4 h of sitting while immersed to the neck in thermoneutral water, and 4 h of lying in thermoneutral water to the neck. The rebreathing method employed a test gas mixture containing 0.5% C2H2, 0.3% C(18)O, 10% He, 21% O2, and balance N2. It is shown that immersion to the neck in the seated posture results in significant increases in sodium excretion cardiac output, and diffusing capacity per unit of alveolar volume. The pulmonary tissue plus capillary volume did not change, demonstrating that the central vascular engorgement induced by water immersion is not accompanied by significant extravasation of fluid into the pulmonary interstitial space. S.D.

A76-25456 **Prediction of body density in young and middle-aged men.** M. L. Pollock, T. Hickman, Z. Kendrick, A. Jackson, A. C. Linnerud, and G. Dawson (Institute for Aerobics Research, Dallas; Houston, University, Houston, Tex.; Wake Forest University, Winston-Salem; North Carolina State University, Raleigh; North Carolina, University, Charlotte, N.C.). *Journal of Applied Physiology*, vol. 40, Mar. 1976, p. 300-304. 30 refs.

Prediction of body density (BD) for samples of young (18-22 yr) and middle-aged (40-55 yr) men is studied, with particular emphasis on the questions whether regression equations can be generalized to populations of young and middle-aged men or specific-population equations are needed, and whether a greater variety of independent variables will increase the predictability of BD in middle-aged men. Anthropometric determinations include seven skinfold fat, 11 girth, and seven diameter measures; vital capacity, residual volume, and BD by underwater weighing are determined. A multiple stepwise regression analysis is used to isolate the independent variables responsible for a significant proportion of BD variance and to develop regression equations for predicting BD. The results confirm the need for different regression equations for young and middle-aged populations. The most accurate prediction for young men is with two skinfold fat, four girth, and two diameter measures, while two skinfold and three girth measures are required for middle-aged men. S.D.

A76-25457 **Single-breath oxygen tests for individual lungs in awake man.** A. R. Frazier, K. Rehder, A. D. Sessler, J. R. Rodarte, and R. E. Hyatt (Mayo Clinic and Mayo Foundation, Rochester, Minn.). *Journal of Applied Physiology*, vol. 40, Mar. 1976, p. 305-311. 21 refs. Research supported by the Parker B. Francis Foundation; Grants No. NIH-HL-12090; No. NIH-HL-16726; No. NIH-HL-12229; No. NIH-RR-585.

Results are presented for single-breath oxygen tests and simultaneous measurements of expiratory flows for individual lungs in normal awake volunteers in the supine and lateral decubitus postures. The volumes at which individual lungs and the total lung reached flow limitation are determined by selecting the point on the appropriate flow-volume curves where a sudden progressive decrease in flow has occurred. Closing volumes (CVs) are calculated by determining the point at which expired nitrogen concentration tracings departed incontrovertibly from the best-fit lines drawn through the last half of the alveolar plateaus. The slope of the alveolar plateau (phase III) is determined from the best-fit line drawn from 70% of vital capacity to onset of CV. Major findings are asynchronous onset of CV, asynchronous onset of expiratory flow limitation, asynchronous (sequential) emptying of the individual lungs throughout expiration, and no changes in CV and slope of phase III in individual lungs upon changing body position. S.D.

A76-25458 **Human lung mechanics during water immersion.** C. Prefaut, E. Lupi-H, and N. R. Anthonisen (Royal Victoria Hospital; McGill University, Montreal, Canada). *Journal of Applied Physiology*, vol. 40, Mar. 1976, p. 320-323. 27 refs. Research supported by the Medical Research Council and Defence Research Board of Canada.

Lung recoil was studied in five healthy male volunteers aged 30-40 yr standing immersed in water to the level of the chin under different breathing conditions. Lung volumes, deflation static pressure-volume curves of the lung, maximum expiratory flow-volume curves, and closing capacities were measured in air and water. A major conclusion is that immersion did not change lung elastic properties inasmuch as recoil was increased at high lung volumes and decreased at low. Immersion-induced changes in recoil were interpreted as being primarily due to vascular congestion. Closing capacities by the N2 technique were unchanged, but the slope of the alveolar plateau and the amplitude of cardiogenic oscillations were decreased in some individuals. Lung volume changes observed with immersion were similar to those documented by others. S.D.

A76-25459 **Transit time analysis of the forced expiratory spirogram in growth.** N. Neuburger, H. Levison, A. C. Bryan, and K. Kruger (Toronto, University; Hospital for Sick Children, Toronto, Canada). *Journal of Applied Physiology*, vol. 40, Mar. 1976, p. 329-332. 9 refs. Research supported by the Medical Research Council of Canada and by Canadian Cystic Fibrosis Foundation.

In the search for more sensitive indicators of airway obstruction Fish et al. (1974) have proposed a transit time analysis of the forced expiratory spirogram. In this method the forced vital capacity (FVC) is divided into volumes of air and each volume is assigned a transit time; the nature of the FVC can be described by the transit times' mean, standard deviation, and index of skewness. In a group of 48 healthy nonsmoking subjects between the ages of 9 and 22 yr it was found that all three quantities decreased with increasing age. This demonstrates an improvement in the function of the peripheral airways with lung growth. In contrast to the increase in flow rates with lung growth, none of this improved function can be attributed to increased lung volume. (Author)

A76-25460 **Effects of hypocapnia and hypocapnic alkalosis on cardiovascular function.** C. W. Zwillich, D. J. Pierson, E. M. Creagh, and J. V. Weil (Colorado, University, Denver, Colo.). *Journal of Applied Physiology*, vol. 40, Mar. 1976, p. 333-337. 17 refs. Grant No. NIH-HL-14985.

Experiments were conducted on adult male mongrel dogs to evaluate the effects of hypocapnic alkalosis induced by mechanical hyperventilation on circulatory function and to determine whether fluid osmolar loading alters these effects. The influence of hypocapnia in the absence of alkalosis on cardiovascular function in the intact animal was also examined. Four groups were studied: fluid load control, fluid load-isolated hypocapnia, fluid load-hypocapnic alkalosis, and no fluid load-hypocapnic alkalosis. It is shown that cardiac output and stroke volume decrease in response to hypocapnic alkalosis, but both are maintained with a fluid load at the expense of an increased left ventricular preload. S.D.

A76-25461 **Effects of hypercapnia on mouth pressure during airway occlusion in conscious man.** M. D. Altose, S. G.

Kelsen, N. N. Stanley, R. S. Levinson, N. S. Cherniack, and A. P. Fishman (Pennsylvania, University, Philadelphia, Pa.). *Journal of Applied Physiology*, vol. 40, Mar. 1976, p. 338-344. 24 refs. Grant No. PHS-HL-08805.

An experimental study was carried out to determine the airway pressure generated by the inspiratory muscle during periods of arrested airflow in conscious male subjects aged 22-41 yr. Airflow was prevented by completely occluding the airway for one breath and by inspiratory threshold loading which prevented airflow only at the beginning of inspiration. Changes in ventilation were compared to those in airway pressure during hypercapnia to determine how the two measures compared as indices of chemosensitivity. The effects of inspiratory flow-resistive loading on chemosensitivity were examined using the inspiratory muscle force as an index of respiratory activity. Excellent correlations were revealed between the level of hypercapnia and the peak end-respiratory pressure during airway occlusion and between hypercapnia and the pressure generated at fixed intervals after the onset of inspiration. Occluded mouth pressure appears to reflect total respiratory neural activity and hence proves useful in studying the regulation of respiration. S.D.

A76-25462 **Effects of hypercapnia and flow-resistive loading on tracheal pressure during airway occlusion.** M. D. Altose, S. G. Kelsen, N. N. Stanley, N. S. Cherniack, and A. P. Fishman (Pennsylvania, University, Hospital, Philadelphia, Pa.). *Journal of Applied Physiology*, vol. 40, Mar. 1976, p. 345-351. 29 refs. Grant No. PHS-HL-08805.

The tracheal pressure generated by the inspiratory muscles during airway occlusion (occluded tracheal pressure) was measured during progressive hypercapnia in anesthetized dogs breathing normally and breathing against added flow-resistive loads in order to determine whether the isometric force of contraction of the inspiratory muscles could be used to assess respiratory efferent neural activity. Since vagal feedback mechanisms influence respiratory activity and diaphragmatic electrical activity is affected by vagotomy, the effect of vagotomy on occluded tracheal pressure during hypercapnia was examined. It is shown that occluded tracheal pressure is suitable for measuring respiratory efferent neural activity and can be used as an index of CO2 responsivity even during mechanical loading. S.D.

A76-25463 **Convective and diffusive gas mixing in human lungs - Experiments and model analysis.** R. S. Sikand, H. Magnussen, P. Scheid, and J. Piiper (Max-Planck-Institut für experimentelle Medizin, Göttingen, West Germany). *Journal of Applied Physiology*, vol. 40, Mar. 1976, p. 362-371. 19 refs. Research supported by the Bergbau-Berufsgenossenschaft.

Equilibration of inspired gas with lung residual gas was studied by a single-breath technique for varying breath-holding time (b.h.t.) with He, Ar, and SF6 as test gases. The ratio of mean lung to end expired concentration after expiration was always below unity, indicating imperfect mixing of gas in the lung. This ratio for all gases increased with b.h.t.; the ratio was smallest for SF6 and greatest for He. Bohr dead space at any given b.h.t. was greatest for SF6 and smallest for He, decreasing toward an asymptotic value common for all gases as b.h.t. increased. The results were analyzed quantitatively on a serial three-compartment model of the lung. Both diffusion and convection are apparently effective in equilibrating test gases in the lung during breath holding. Stratified inhomogeneities in the absence of convective gas mixing in the alveolar space would seriously limit alveolar respiratory gas exchange; with convection, stratification is likely to impose only moderate constraints on resting gas exchange. (Author)

A76-25464 **Effect of hypoxia on the pressure developed by inspiratory muscles during airway occlusion.** S. G. Kelsen, M. D. Altose, N. N. Stanley, R. S. Levinson, N. S. Cherniack, and A. P. Fishman (Pennsylvania, University, Philadelphia, Pa.). *Journal of Applied Physiology*, vol. 40, Mar. 1976, p. 372-378. 21 refs. Grant No. PHS-HL-08805.

Experiments were conducted to evaluate the effect of progressive isocapnic hypoxia on the pressure developed by the inspiratory muscles during airway occlusion in normal male subjects aged 28-42 yr and to determine whether changes in pressure developed during occlusion can be used as an index of inspiratory motoneuron activity and whether this activity was measured by changes in occlusion pressure is affected by increasing the resistance to breathing. Results indicate that the occlusion pressure response to hypoxia seems to be a reliable measure of respiratory center output. Increase in occlusion pressure in the presence of flow-resistive loading appears to represent a neurally mediated increase in inspiratory motoneuron activity. S.D.

A76-25465 **Central circulation during exercise after venesection and reinfusion of red blood cells.** B. Ekblom, P.-O. Astrand (Gymnastik-och Idrottshogskolan, Stockholm, Sweden), and G. Wilson. *Journal of Applied Physiology*, vol. 40, Mar. 1976, p. 379-383. 16 refs. Research supported by the Swedish Sports Federation.

The effect of different levels of Hb concentration on central circulation during submaximal and maximal exercises was studied in five well-trained individuals (aged 23-31 yr) subjected to venesection and reinfusion of red blood cells. Three different situations were examined: control, after venesection of 800 ml of whole blood, and after reinfusion of packed red blood cells about 30-35 days after venesection. It is found that the maximal values of cardiac output, heart rate, and stroke volume remain the same in all the three groups. The importance of Hb concentration in determining maximal oxygen uptake during short (3-8 min) maximal exercise involving large muscle groups is demonstrated. At a given submaximal oxygen uptake, the heart rate and blood lactates increased with lowered Hb concentration and decreased with increased Hb concentration as compared to control levels. S.D.

A76-25466 **Heat storage regulation in exercise during thermal transients.** P. Chappuis, P. Pittet, and E. Jéquier (Lausanne, Université, Lausanne, Switzerland). *Journal of Applied Physiology*, vol. 40, Mar. 1976, p. 384-392. 26 refs. Research supported by the Nestlé Co.

Thermal balance and thermoregulatory adjustments during exercise in humans subjected to three ambient temperatures (20, 25, and 30 C) and two work intensities (40 and 90 W) were studied through simultaneous use of direct and indirect calorimetry. Changes in heat storage are evaluated along with the relationship between sweating rate and variations of mean body temperature. The effects of ambient temperature, skin temperature, and work intensity on thermoregulatory responses are examined. It is shown that during the thermal transients and the steady state of exercise, the calorimetric method allows immediate measurement of heat storage, since all the physical terms of the body heat balance equation are determined. Evaluation of mean body temperature by thermometry is not directly applicable during thermal transients, unless the resulting time delay between thermometric and calorimetric measurements is taken into account. The results are in agreement with the model of proportional control proposed by Hardy (1961) and Hammel (1968). The data support the hypothesis that the mean body temperature is the regulated variable of the thermoregulatory system in man. S.D.

A76-25467 **Adaptive modifications in the thermoregulatory system of long-distance runners.** E. Baum, K. Brück, and H. P. Schwennicke (Giessen, Universität, Giessen, West Germany). *Journal of Applied Physiology*, vol. 40, Mar. 1976, p. 404-410. 30 refs. Research supported by the Deutsche Forschungsgemeinschaft. DFG Project B1,SFB-122.

In seven long-distance runners the thermoregulatory responses to acute external cooling and heating under resting conditions were recorded and compared with those in physically untrained controls. Sweating as well as shivering thresholds were significantly decreased in the runners when compared either in terms of mean body temperature or esophageal temperature; these were reduced in the runners at rest under thermoneutral conditions. Moreover, cold sensation in the runners occurred at lower mean body temperature.

As for the sweating threshold, the shift is quantitatively comparable to that found in heat adaptation. The described modifications in long-distance runners would prolong the time period until a dangerous body temperature is reached during heavy exercise. (Author)

A76-25468 **Influence of bronchomotor tone on regional ventilation distribution at residual volume.** L. A. Engel, L. Landau, L. Taussig, G. Sybrecht (McGill University Clinic; Royal Victoria Hospital, Montreal, Canada), and R. R. Martin. *Journal of Applied Physiology*, vol. 40, Mar. 1976, p. 411-416. 17 refs. Research supported by the Medical Research Council of Canada.

The distribution of regional volume and of inspired gas at residual volume (RV) is studied using xenon-133 in seated normal subjects before and after aerosolized isoprenaline and after aerosolized metacholine hydrochloride. The effect of bronchomotor tone on regional ventilation distribution at RV is evaluated. It is found that changes in bronchomotor tone influence the distribution of regional volume and/or the distribution of gas inspired at RV. There is not enough evidence to infer whether the normal degree of bronchomotor tone impedes or enhances airway closure. S.D.

A76-25469 **Influence of diaphragmatic contraction on ventilation distribution in horizontal man.** C. S. Roussos, Y. Fukuchi, P. T. Macklem, and L. A. Engel (McGill University Clinic; Royal Victoria Hospital, Montreal, Canada). *Journal of Applied Physiology*, vol. 40, Mar. 1976, p. 417-424. 24 refs.

An investigation was conducted of single-breath helium washouts in six subjects in the lateral decubitus and supine positions. The results of the investigation suggest that the gradient of pleural pressure in the vertical direction changes in the horizontal subject in accordance with the degree of diaphragmatic tone. It is, therefore, believed that differences in applied pressure changes must contribute to the distribution of ventilation in man breathing spontaneously in the horizontal posture. G.R.

A76-25470 **A square-pulse flow method for measuring characteristics of the arterial bed.** M. G. Bottomley and G. W. Mainwood (Ottawa, University, Ottawa, Canada). *Journal of Applied Physiology*, vol. 40, Mar. 1976, p. 425-433. 15 refs. Research supported by the Medical Research Council of Canada.

In the described investigation the heartbeat was transiently arrested and a single known input was given to the systemic arterial bed in the form of a square-wave infusion. The pressure response to this infusion was monitored. A theory for the evaluation of the obtained data is discussed. The methods used in the investigation are considered, taking into account the apparatus developed to provide a square-wave infusion of blood, the isolation of the arterial bed from disturbing influences, and the preparation of the rabbits used in the studies. The considered approach makes it possible to determine three variables associated with the arterial bed, including compliance, peripheral resistance, and mean critical closing pressure. G.R.

A76-25471 **Reflex and mechanical circulatory effects of graded Valsalva maneuvers in normal man.** P. I. Korner, A. M. Tonkin, and J. B. Uther (Royal Prince Alfred Hospital; Sydney, University, Sydney, Australia). *Journal of Applied Physiology*, vol. 40, Mar. 1976, p. 434-440. 32 refs. Research supported by the Life Insurance Medical Research Fund of Australia and New Zealand, National Heart Foundation of Australia, and National Health and Medical Research Council.

The reflex autonomic and mechanically determined components of various circulatory responses to graded expiratory pressure strains in normal catheterized subjects (11 male and 6 female) are analyzed. Expiratory pressure/circulatory response curves are obtained in each subject before autonomic block, after pharmacological block of the cardiac autonomic effectors, and after 'total' autonomic block of cardiac and peripheral constrictor mechanisms. The results indicate that graded changes in expiratory pressure during the Valsalva maneuver evoke reflex rises in the heart rate and total peripheral resistance varying in magnitude with the size of the forced-expiration stimulus. These restore the mean arterial blood pressure to resting or above and attenuate slightly the reduction in CO which occurs as a result of the mechanical effects of the Valsalva maneuver as observed during autonomic block. S.D.

A76-25472 **Oxygen electrode syringe as an instrument for determining oxygen-hemoglobin dissociation curves.** V. A. Knight (University College, Cardiff, Wales.). *Journal of Applied Physiology*, vol. 40, Mar. 1976, p. 441, 442.

A new instrument is described which simplifies the measurement of the oxygen-hemoglobin dissociation curve, using small volumes of blood. An oxygen electrode, as the plunger of a syringe accommodating increasing volumes of blood at predetermined levels of saturation with oxygen, measures the amount of dissolved oxygen in the plasma, which is proportional to the gas tension. (Author)

A76-25473 **A clinical catheter for continuous blood gas measurement by mass spectrometry.** J. W. Brantigan, K. L. Dunn, and D. Albo (Utah, University, Salt Lake City, Utah). *Journal of Applied Physiology*, vol. 40, Mar. 1976, p. 443-446. 5 refs. Research supported by the Sorenson Research Corp. and Perkin-Elmer Corp.

A76-25474 **Transthoracic admittance plethysmograph for measuring cardiac output.** H. Ito, K.-I. Yamakoshi, and T. Togawa (Tokyo Women's Medical College; Tokyo Medical and Dental University, Tokyo, Japan). *Journal of Applied Physiology*, vol. 40, Mar. 1976, p. 451-454. 6 refs.

A plethysmograph for measuring ventricular stroke volume (SV) from the transthoracic admittance variation was developed. A correlation study between the SV values determined by this method and those measured by Kubicek's transthoracic impedance method was carried out on 24 healthy subjects; the correlation coefficient was 0.99. Based on the results obtained through the study, it was concluded that the admittance method was more advantageous than the impedance method for measuring SV. (Author)

A76-25475 **Changes in cold-induced vasodilation during Arctic exercises.** S. D. Livingstone (Defence and Civil Institute of Environmental Medicine, Downsview, Ontario, Canada). *Journal of Applied Physiology*, vol. 40, Mar. 1976, p. 455-457. 18 refs.

The cold-induced vasodilation (CIVD) response of military personnel both before and after two-weak exercises in the Arctic is studied to determine the effect of a relatively short-term cold exposure on this response. CIVD is measured in the left middle finger of each subject by its immersion in ice water. The results obtained indicate that over a short period of time in cold conditions there is a general tendency toward an increased vasoconstriction in the cold in the subjects tested. It is suggested that the effect of short-term cold exposure is to produce a general rather than peripheral acclimation. It may be that after a longer exposure to cold the extremities will become acclimated and show the responses observed in native and other individuals acclimated to cold over an extended period of time. S.D.

A76-25495 * **Unified Mars life detection system.** J. P. Martin (Martin Marietta Aerospace, Denver, Colo.), R. D. Johnson (NASA, Ames Research Center, Flight Experiments Office, Moffett Field, Calif.), B. Kok, and R. Radmer (Martin Marietta Laboratories, Baltimore, Md.). *Journal of the Astronautical Sciences*, vol. 23, Apr.-June 1975, p. 99-119.

The Mars life detection system described is based on the use of a central mass spectrometer which is capable to conduct analyses of trace gases from a variety of different experiments. The system, which is intended for potential future missions, represents a marked improvement over the devices used in the Viking experiments. The new system can also be used to obtain important information about the chemical environment of Mars. Tests can be conducted for water and for amino acids. Experiment concepts for the Mars life detection

system are discussed along with aspects of instrumentation development. G.R.

A76-25567 # **Methods of engineering-psychological investigations in aviation (Metody inzhenerno-psikhologicheskikh issledovanii v aviatsii).** Iu. P. Dobrolenskii, N. D. Zavalova, V. A. Ponomarenko, and V. A. Tuvaev. Moscow, Izdatel'stvo Mashinostroenie, 1975. 280 p. 169 refs. In Russian.

Techniques of psychological investigations of the activity of a pilot in aircraft control are outlined. The fundamental concepts of engineering psychology and psychology of pilot activity are discussed along with an analysis of the problems related to engineering-psychological investigations of the pilot/aircraft interface. Particular attention is devoted to the methodology of formulating and conducting these investigations, to the selection and determination of estimates for pilot activity, and to the statistical treatment of experimental results. Also discussed are methods for estimating aircraft data display systems and pilot activity in emergency flight situations and during automatic aircraft control. S.D.

A76-25614 **Meaning, memory structure, and mental processes.** D. E. Meyer (Bell Telephone Laboratories, Inc., Murray Hill, N.J.) and R. W. Schvaneveldt (New York, State University, Stony Brook, N.Y.). *Science*, vol. 192, Apr. 2, 1976, p. 27-33. 33 refs.

Reaction time studies indicate that recognition of words in close proximity is facilitated when the words are closely related in meaning, particularly when the words are obscured by visual distortions. Close relations between word meanings can also facilitate the comprehension of sentences, except when the relation between the meanings of two words in close proximity must be carefully analyzed. These results support the hypothesis that human memory accelerations and of the absolute and relative accelerations of the human operator are obtained. C.K.D.

A76-25623 # **Analysis of neural mechanisms for emotional changes of the heart's activity (Do analizu nervovikh mekhanizmiv emotsional'nikh zmin sertsevoi diial'nosti).** O. V. Obonits'ka and N. V. Maevs'ka (Donets'kii Medichnii Institut, Donetsk, Ukrainian SSR). *Fiziologichnii Zhurnal*, vol. 22, Jan.-Feb. 1976, p. 65-71. 17 refs. In Ukrainian.

Fifteen minute emotional stimulation in dogs was accompanied by significant tachycardia developing within the first 10 seconds of the stimulation, and by changes in the ECG pattern, where breaking of the R and T waves predominates. Separate switching off of the sympathetic or parasympathetic nerves of the heart or complete denervation act unidirectionally, sharply weakening or totally eliminating emotional tachycardia. It is concluded that emotional changes of the heart's activity are accomplished mainly by neural means as a result of the interaction of sympathetic and parasympathetic mechanisms. P.T.H.

A76-25624 # **The minute volume of blood circulation and mental activity (Khvilinnii ob'em krovoobigu ta rozumova diial'nist').** S. M. Rashman (Kiivs'kii Pedagogichnii Institut, Kiev, Ukrainian SSR). *Fiziologichnii Zhurnal*, vol. 22, Jan.-Feb. 1976, p. 72-77. 10 refs. In Ukrainian.

The changes in stroke and minute volume under the influence of mental activity with different nervous-emotional components were studied in human subjects. Tense mental activity without pronounced emotional components does not cause any significant changes in the minute volume, although a tendency of the heart rate to decrease and the stroke volume to increase towards the end of the work is observed. Mental activity with strong emotional component (examination conditions) causes substantial increase in the minute volume, accompanied by increase in stroke volume and heart rate. These increases of stroke volume and heart rate under the influence of nervous-emotional mental activity were characterized by a correlative, but not proportional, connection. Heart rate changes were mobile. P.T.H.

A76-25625 # **Method of estimating motor activity during sleep (Metod otsinki rukhovoi aktivnosti u period snu).** O. N. Lebid' (Voroshilovgrads'kii Medichnii Institut, Voroshilovgrad, Ukrainian SSR). *Fiziologichnii Zhurnal*, vol. 22, Jan.-Feb. 1976, p. 129-131. 6 refs. In Ukrainian.

A device for integrating the total time of motor activity during sleep is described, which enables automatic determination of the total time of motion of a subject during various time intervals. Some results on the analysis of the dynamics of the total time of motion of a subject during sleep are discussed. The ratio of the time of motor activity to the time of prolonged sleep may be a quantitative index of depth of sleep. P.T.H.

A76-25641 # **Criteria on the minimum dynamical effects for the operator's hand-tool system.** C. Cempel (Poznan, Politechnika, Poznan, Poland). *Zagadnienia Drgan Nieliniowych*, no. 16, 1975, p. 165-171. 5 refs.

The acceleration acting upon the palm of an operator holding a tool with a given acceleration receptance, defined analogously to the displacement acceptance, and with an exciting force of known spectral density, is investigated. It is shown that viscous damping in susceptible elements is undesirable, especially at higher frequencies. The amplitudes of acceleration are best minimized by using susceptible elements with hysteresis-type damping. A criterion is developed for minimum dynamical effects in a composite system composed of tool-susceptible element-human operator. C.K.D.

A76-25642 # **Influence of stochastic excitations on the human body.** M. Ksiazek and J. Niziol (Krakow, Politechnika, Krakow, Poland). *Zagadnienia Drgan Nieliniowych*, no. 16, 1975, p. 173-184. 6 refs.

The effect of random vibrations on the human body is investigated using a model in which the body is treated as a lumped system with one degree of freedom. The man-machine interaction is assumed to be a random steady-state process. The system is described by a differential equation with randomly varying coefficients, which is solved by a method close to the Bogoliubov-Mitropol'skii method. The stochastic characteristics of the system displacements and accelerations and of the absolute and relative accelerations of the human operator are obtained. C.K.D.

A76-25645 **Measures of attention as predictors of flight performance.** R. A. North and D. Gopher (Illinois, University, Urbana, Ill.). *Human Factors*, vol. 18, Feb. 1976, p. 1-13. 16 refs. Contract No. F44620-70-C-0105.

A new technique for measuring individual differences in basic attention capabilities and the validity of these differences in predicting success in flight training were investigated. The testing system included a digit-processing, reaction-time task and a one-dimensional compensatory tracking task. Comparisons were made between separate and concurrent performances of these tasks, with both equal and shifting task priorities. Adaptive techniques were employed to obtain maximum performance levels for each subject in the single-task condition and to maintain dual-task difficulty within subjects. Consistent individual differences in basic attention capabilities were observed and several dimensions of attention capabilities are suggested. A preliminary validation study compared scores for flight instructors and student pilots. In addition, the student sample was dichotomized based on performance in training. There were reliable differences for both groups on dual-task performance efficiency. (Author)

A76-25646 **Peripheral detection and central task complexity.** A. E. Bartz (Concordia College, Moorhead, Minn.). *Human Factors*, vol. 18, Feb. 1976, p. 63-69. 21 refs. Grant No. NIH-MH-22025.

Subjects verbally tracked a central task that differed on a complexity dimension (subsets of two, four, or eight digits), while indicating their detection of small peripheral lights by pressing a hand-held switch. Teichner's stress theory would predict that the more complex the central task, the longer would be the reaction

times to the peripheral lights, and that the differences would be most pronounced in the far periphery (the funneling effect). Hebb's arousal theory, applied to vigilance behavior, would predict the opposite effect, where increasing the complexity of the central task would heighten the subject's vigilance performance. The results supported an arousal interpretation, with faster reaction times to the peripheral lights as central task complexity increased. (Author)

STAR ENTRIES

N76-18773# Canada Inst. for Scientific and Technical Information, Ottawa (Ontario).
CYTOCROME 553 OF THE ALGA BUMILLERIOPSIS FILIFORMIS
H.-J. Lach, H. G. Ruppel, and P. Boeger. 1976. 28 p. refs. Transl. into ENGLISH from Z. Pflanzenphysiol. (Stuttgart), v. 70, no. 5, 1973. p 432-451.
(NRC/CNR-TT-1844) Avail: NTIS HC $4.00.

Cytochrome 553 of the alga Bumilleriopsis filiformis Vischer (Chrysophycease) was purified to apparent homogeneity; disc electrophoresis gave only a single band. Some physical and chemical properties are described. It is an f-type cytochrome localized in the plastids and present in a molar ratio of 1 to 300-400 chlorophyll molecules under the culture conditions used. Author

N76-18774*# California Univ., Berkeley. White Mountain Research Station.
PHYSIOLOGICAL RESPONSES TO ENVIRONMENTAL FACTORS RELATED TO SPACE FLIGHT Semiannual Status Report, 1 Feb. - 31 Jul. 1975
Nello Pace, Benjamin W. Grunbaum, Arthur M. Kodama, Richard C. Mains, and Donald F. Rahlmann. 31 Jul. 1975. 65 p.
(Grant NGL-05-003-024)
(NASA-CR-146423; SASR-27) Avail: NTIS HC $4.50 CSCL 06S.

Physiological procedures and instrumentation developed for the measurement of hemodynamic and metabolic parameters during prolonged periods of weightlessness are described along with the physiological response of monkeys to weightlessness. Specific areas examined include: cardiovascular studies; thyroid function; blood oxygen transport; growth and reproduction; excreta analysis for metabolic balance studies; and electrophoretic separation of creatine phosphokinase isoenzymes in human blood. J.M.S.

N76-18775*# Food and Drug Administration, Cincinnati, Ohio. Food Research Lab.
ECOLOGY AND THERMAL INACTIVATION OF MICROBES IN AND ON INTERPLANETARY SPACE VEHICLE COMPONENTS Quarterly Progress Report, 1 Jul. - 30 Sep. 1975
A. L. Reyes and J. E. Campbell. Dec. 1975. 16 p. refs. Submitted for publication.
(NASA Order W-13411)
(NASA-CR-146429; QPR-42) Avail: NTIS HC $3.50 CSCL 06M.

Statistical techniques which have relevance to studies on the thermal inactivation on bacterial spores are discussed. Author

N76-18776# Armed Forces Radiobiology Research Inst., Bethesda, Md.
OCTOPAMINE RECEPTORS ON APLYSIA NEURONS: FURTHER EVIDENCE FOR A FUNCTION OF OCTOPAMINE AS A NEUROTRANSMITTER
D. O. Carpenter and G. L. Gaubatz. May 1975. 14 p. refs. Sponsored by Defense Nuclear Agency.
(DNA Proj. NWED-QAXMC912)
(AD-A013030; AFRRI-SR75-12) Avail: NTIS CSCL 06/15.

Some neurons in Aplysia have receptors which are much more sensitive to octopamine than any other structurally related compound. Most such receptors mediate a hyperpolarizing conductance increase to K(+). These responses when considered with the octopamine content of whole ganglia and single neurons strongly suggest that octopamine is a neurotransmitter in Aplysia. GRA

N76-18777 Florida State Univ., Tallahassee.
THE EFFECTS OF A MUSCLE ENDURANCE TRAINING PROGRAM ON CARDIOVASCULAR FUNCTION AS MEASURED ON THE BICYCLE ERGOMETER Ph.D. Thesis
William Thomas Boone. 1975. 65 p.
Avail: Univ. Microfilms Order No. 76-2626.

Pretests and posttests were administered prior to and immediately after the training period in order to evaluate the effects of the training program. Forty male college students participated in the study. Steady state and exhaustive exercise measurements were used to determine the effects of the training program on selected cardiovascular parameters. The physiological parameters examined in this study were: (1) metabolic functions (oxygen uptake, arteriovenous oxygen difference, oxygen pulse, and peak oxygen pulse), (2) hemodynamics (cardiac output, stroke volume, and heart rate), (3) thigh circumference, strength and endurance measurements, and (4) physical work capacity. The data for all variables were subjected to separate analyses of covariance. Results indicated significant differences between the adjusted posttest means for each of the following variables: resting heart rate, steady state heart rate, and muscle endurance. Dissert. Abstr.

N76-18778*# Transemantics, Inc., Washington, D.C.
TEST OF MODELIZATION FOR SWEATING DURING MUSCULAR EXERCISE
Jean Timbal, Monique Loncle, Jean Durand-Bailloud, and Charles Boutelier. NASA. Mar. 1976. 11 p. refs. Transl. into ENGLISH from Compt. Rend. Soc. Biol. (Paris), v. 169, no. 4, 1975. p 872-876.
(Contract NASw-2792)
(NASA-TT-F-16908) Avail: NTIS HC $3.50 CSCL 06A.

From a practical viewpoint, thermal sweating during exercise can be described by an exponential equation. The errors obtained by using this mathematical model are of minor importance. Nevertheless, metrological and physiological factors can theoretically complicate the model. Author

N76-18779*# Joint Publications Research Service, Arlington, Va.
BODY FUNCTIONS AND METABOLISM DURING PROLONGED HYPOKINESIA IN AN INTEGRATED EXPERIMENT
Ye. A. Kovalenko, E. S. Mailyan, V. L. Popkov, Yu. S. Galushko, A. A. Prokhonchukov, Z. S. Dopgun, Yu. I. Kondratyev, M. I. Kozar, G. P. Tikhonova, and A. G. Kolesnik. Washington. NASA. Feb. 1976. 39 p. refs. Transl. into ENGLISH from Usp. Fiziol. Nauk (USSR), v. 6, no. 3, 1975. p 110-136.
(NASA Order W-13183)
(NASA-TT-F-16882) Avail: NTIS HC $4.00 CSCL 06S.

The effect of prolonged hypokinesia was studied on white rats in special restraining cages. Significant changes in total gas and energy metabolisms as well as in tissue oxidative processes were observed. A sharp retardation of weight increase and a significant retardation of growth in the muscular system developed. Significant deviations arose in mineral and protein metabolism indices and tissue structures of the myocardium and liver became disturbed. It was shown that prolonged hypokinesia is accompanied by phasic changes in functional activity of the hypophyseal/adrenal system and the thymolymphatic apparatus, as well as by disturbance of the serotonin metabolism. Transition to normal motor activity does not normalize hypophyseal/adrenal system and serotonin metabolism for 30 to 40 days. Author

N76-18780*# National Aeronautics and Space Administration, Ames Research Center, Moffett Field, Calif.
THE PHYSIOLOGY AND BIOCHEMISTRY OF TOTAL BODY IMMOBILIZATION IN ANIMALS: A COMPENDIUM OF RESEARCH
Karen J. Dorchak and John E. Greenleaf. Washington. Feb.

1976 53 p refs
(NASA-TM-X-3306; A-6039) Avail: NTIS HC $4.50 CSCL 06S

Major studies that describe the physiological and biochemical mechanisms which operate during total body restraint (confinement in cages for example) are presented. The metabolism and behavior of various animals used in medical research (dogs, monkeys, rats, fowl) was investigated and wherever possible a detailed annotation for each study is provided under the subheadings: (a) purposes, (b) procedures and methods, (c) results, and (d) conclusions. Selected references are also included.
Author

N76-18781*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
PHYSIOLOGIC RESPONSES TO WATER IMMERSION IN MAN: A COMPENDIUM OF RESEARCH
James Kollias, Dena VanDerveer, Karen J. Dorchak, and John E. Greenleaf Washington Feb. 1976 90 p refs
(NASA-TM-X-3308; A-6038) Avail: NTIS HC $5.00 CSCL 06S

A total of 221 reports published through December 1973 in the area of physiologic responses to water immersion in man were summarized. The author's abstract or summary was used whenever possible. Otherwise, a detailed annotation was provided under the subheadings: (1) purpose, (2) procedures and methods, (3) results, and (4) conclusions. The annotations are in alphabetical order by first author; author and subject indexes are included. Additional references are provided in the selected bibliography.
Author

N76-18782*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
LIQUID-COOLED BRASSIERE Patent Application
William Elkins (Acurex Corp.), Bill Alvin Williams, and Ernest Glenn Tickner, inventors (to NASA) (Acurex Corp.) Filed 27 Jan. 1976 18 p
(NASA-Case-ARC-11007-1; US-Patent-Appl-SN-652948) Avail: NTIS HC $3.50 CSCL 06B

A device is described for enhancing the detection of malignant tissue in the breasts of a woman. It is comprised of a brassiere-like garment which is fitted with a pair of liquid-perfused cooling panels which completely and compliantly cover the breasts and upper torso. The garment is connected by plastic tubing to a liquid cooling system composed of a fluid pump, a solenoid control valve for controlling the flow of fluid to either the cooling unit or the heating unit, a fluid reservoir, a temperature sensor in the reservoir, and a restrictor valve to control the pressure in the garment inlet cooling line.
NASA

N76-18783*# Massachusetts Inst. of Tech., Cambridge. Man-Vehicle Lab.
RESEARCH ON HABITUATION TO NOVEL VISUAL-VESTIBULAR ENVIRONMENTS WITH PARTICULAR REFERENCE TO SPACE FLIGHT Progress Report, Mar. 1975 - Feb. 1976
Laurence R. Young 27 Feb. 1976 114 p refs
(Grant NsG-2032)
(NASA-CR-146280) Avail: NTIS HC $5.50 CSCL 05E

Progress in the development of a cohesive theory of the underlying physiological mechanisms associated with spatial orientation in unusual environments is described. Results can be applied to providing means of preventing and/or minimizing the space motion sickness which has been observed during prolonged space missions. Three major areas were investigated: (1) the interaction of visual and vestibular cues in conflict in the human, (2) the plasticity of the vestibulo-ocular reflex in monkeys, and (3) end organ function in the ray with particular emphasis on the effect of ionic concentration.
Author

N76-18784# Air Force Flight Dynamics Lab., Wright-Patterson AFB, Ohio.
LOW VISIBILITY LANDING PILOT MODELING EXPERIMENT AND DATA, PHASE 2 Final Report, Oct. - Nov. 1974
R. Gressang Aug. 1975 220 p refs
(Contract DOT-FA70WAI-173; AF Proj. 2187)
(AD-A016764; AFFDL-TR-75-57) Avail: NTIS CSCL 01/2

This report describes an experiment to collect data for modeling pilot behavior during low visibility approach and landing. The data are presented in a form suitable for use in forming a pilot model of the optimal control type. The experiment was conducted as a part of Phase 2 of a low visibility landing simulation program (LOVISIM) conducted at the Air Force Flight Dynamics Laboratory and sponsored by the Federal Aviation Administration.
GRA

N76-18785# Air Force Human Resources Lab., Brooks AFB, Tex.
DESIGN OF A COMPUTER-CONTROLLED, RADOM-ACCESS SLIDE PROJECTOR INTERFACE Final Report, Apr. - Nov. 1974
Paul J. Kirby, Edward M. Gardner, and Lyle R. McKnight Aug. 1975 24 p
(AF Proj. 1121)
(AD-A016726; AFHRL-TR-75-20) Avail: NTIS CSCL 05/9

The Technical Training Division of the Air Force Human Resources Laboratory has a research and development mission to improve Air Force training through the application of instructional and computer technology in the administration and management of individualized instruction. Within this new pedagogic environment, a computer-controlled random-access image projection capability is desired. This is a report on the successful design, development, test and evaluation of an electronic hardware device interfacing a commercially available slide projector with a plasma panel computer terminal. The interface device allows an instructional computer program to select slides for viewing based upon the lesson/student situation parameters of the instructional strategy employed.
GRA

N76-18786# Army Materiel Command, Texarkana, Tex. Intern Training Center.
VISUAL PERFORMANCE UNDER MONOCHROMATIC ILLUMINATION AND SCOTOPIC VISION CONDITIONS Final Report
John G. Delgado Jun. 1975 57 p refs
(AD-A016790; USAMC-ITC-02-08-75-113) Avail: NTIS CSCL 05/5

The objective of this report was to investigate the effect of different colors of illumination on visual performance. The experiment was conducted in a dark room in order to simulate nighttime conditions. Three colors of illumination were selected and the visual performance of ten subjects was examined at three illumination intensity levels. The three colors selected for testing were red, blue, and amber. Task scores, obtained from a manipulative dexterity task, were used to evaluate visual performance. A three-factor, randomized block design model was used to analyze the data of the experiment. The color of illumination, for a manipulative dexterity task, was found to have no significant effect on visual performance at a 5 percent level of significance.
GRA

N76-18787*# Hamilton Standard Div., United Aircraft Corp., Windsor Locks, Conn.
SHUTTLE ENVIRONMENTAL AND THERMAL CONTROL/LIFE SUPPORT SYSTEM COMPUTER PROGRAM, SUPPLEMENT 1 Final Report
W. J. Ayotte Dec. 1975 159 p
(Contract NAS9-12411)
(NASA-CR-147434; SVHSER-6529-Suppl-1) Avail: NTIS HC $6.75 CSCL 06K

The computer programs developed to simulate the RSECS (Representative Shuttle Environmental Control System) were described. These programs were prepared to provide pretest predictions, post-test analysis and real time problem analysis for RSECS test planning and evaluation.
Author

N76-18788*# Stanford Research Inst., Menlo Park, Calif.
ADVANCED RECORDING AND PREPROCESSING OF

PHYSIOLOGICAL SIGNALS Final Report, May - Oct. 1975
Philip B. Bentley Nov. 1975 89 p refs
(Contract NAS2-8836; SRI Proj. 4260)
(NASA-CR-137795) Avail: NTIS HC $5.00 CSCL 06D

The measurement of the volume flow-rate of blood in an artery or vein requires both an estimate of the flow velocity and its spatial distribution and the corresponding cross-sectional area. Transcutaneous measurements of these parameters can be performed using ultrasonic techniques that are analogous to the measurement of moving objects by use of a radar. Modern digital data recording and preprocessing methods were applied to the measurement of blood-flow velocity by means of the CW Doppler ultrasonic technique. Only the average flow velocity was measured and no distribution or size information was obtained. Evaluations of current flowmeter design and performance, ultrasonic transducer fabrication methods, and other related items are given. The main thrust was the development of effective data-handling and processing methods by application of modern digital techniques. The evaluation resulted in useful improvements in both the flowmeter instrumentation and the ultrasonic transducers. Effective digital processing algorithms that provided enhanced blood-flow measurement accuracy and sensitivity were developed. Block diagrams illustrative of the equipment setup are included. Author

N76-18789*# General Electric Co., Philadelphia, Pa. Valley Forge Space Center.
MODULAR BIOWASTE MONITORING SYSTEM Final Report
G. L. Fogal Dec. 1975 203 p
(Contract NAS9-13748)
(NASA-CR-147483; Doc-76SDS4200) Avail: NTIS HC $7.75 CSCL 06K

The objective of the Modular Biowaste Monitoring System Program was to generate and evaluate hardware for supporting shuttle life science experimental and diagnostic programs. An initial conceptual design effort established requirements and defined an overall modular system for the collection, measurement, sampling and storage of urine and feces biowastes. This conceptual design effort was followed by the design, fabrication and performance evaluation of a flight prototype model urine collection, volume measurement and sampling capability. No operational or performance deficiencies were uncovered as a result of the performance evaluation tests. Author

N76-18790*# Martin Marietta Corp., Denver, Colo.
ZERO LIQUID CARRYOVER WHOLE-BODY SHOWER VORTEX LIQUID/GAS SEPARATOR Final Report
Dec. 1975 148 p refs
(Contract NAS9-14577)
(NASA-CR-147500; MCR-76-10) Avail: NTIS HC $6.00 CSCL 06K

The development and evaluation of a liquid/gas vortex type separator design eliminating liquid and semi-liquid (suds) carryover into air recirculating system were described. Consideration was given to a number of soaps other than the 'Miranol JEM' which was the low sudsing soap used in previous test runs of the space shower. Analysis of test parameters and prototype testing resulted in a revised separator configuration and a better understanding of the suds generating mechanism in the waste-water collection system. The final design of the new separator provides for a wider choice of soaps without leading to the problem of 'carryover'. Furthermore, no changes in separator-to-shower interfaces were required. The new separator was retrofitted on the 'space shower' and satisfactorily demonstrated in one-g testing. Author

N76-18791*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
SKYLAB FOOD SYSTEM
Thomas R. Turner and J. Dennis Sanford (Technology, Inc., Houston, Tex.) Oct. 1974 44 p
(NASA-TM-X-58139; JSC-09159) Avail: NTIS HC $4.00 CSCL 06H

A review of the Skylab food system requirements, package designs, and launch configurations was presented. In-flight anomalies were discussed, and between-mission changes in design were described. A discussion of support for Skylab 3 and Skylab 4 mission extensions and of new items launched on these missions is included. Author

N76-18792*# Stanford Research Inst., Menlo Park, Calif.
A TACTILE PAGING SYSTEM FOR DEAF-BLIND PEOPLE, PHASE 1
James A. Baer Feb. 1976 28 p refs
(Contract NAS2-8711; SRI Proj. 3980)
(NASA-CR-137816) Avail: NTIS HC $4.00 CSCL 05H

A tactile paging system for deaf-blind people has been brought from the concept stage to the development of a first model. The model consists of a central station that transmits coded information via radio link to an on-body (i.e., worn on the wrist) receiving unit, the output from which is a coded vibrotactile signal. The model is a combination of commercially available equipment, customized electronic circuits, and electromechanical transducers. The paging system facilitates communication to deaf-blind clients in an institutional environment as an aid in their training and other activities. Several subunits of the system were individually developed, tested, and integrated into an operating system ready for experimentation and evaluation. The operation and characteristics of the system are described and photographs are shown. Author

N76-18793# Payne, Inc., Annapolis, Md.
STABILITY AND LIMB DISLODGEMENT FORCE MEASUREMENTS WITH THE F-105 AND ACES-2 EJECTION SEATS Final Report, 1 Nov. 1973 - 31 Jan. 1975
Peter R. Payne, Fred W. Hawker, and Anthony J. Euler Jul. 1975 65 p refs
(Contract F33615-74-C-4015; AF Proj. 7231)
(AD-A015726; AMRL-TR-75-8; Working-Paper-119-7) Avail: NTIS CSCL 01/3

Forces on the arms and legs of test subjects seated in the F-105 and ACES-II ejection seats were measured over a range of speeds in a wind tunnel. It was found that the forces varied considerably between individuals. The variation was not identified with any outwardly visible physical features of the individuals. Averaged values for the group were compared over a range of pitch and yaw angles and between two different seats. Outward force at the knee was found to vary systematically with yaw angle up to 30 deg, and to be little affected by pitch, and to be practically the same on both seats. Forces at the feet and hands showed less systematic variation and were different between the two seats. Attempts to modify the forces by appurtenances attached to the limbs succeeded only in reducing them for some conditions at the expense of others. Both seats were shown to be statically unstable, with and without occupant, in free flight. Static stability was exhibited when equipped with an array of in-plane stabilizer plates on both the F-105 and ACES-II ejection seats. Pressures inside the helmet, and overall forces tending to remove it, were also measured. Powerful lift forces were derived from low pressures over the outside, quite sufficient to ensure helmet loss at high speed, unless the retention strap is designed to react large loads; in which case, some form of neck injury can be anticipated. GRA

N76-18794# Wisconsin Univ., Madison. Dept. of Industrial Engineering.
VISUAL DYNAMICS WHEN INTERRUPTING A CONTROL TASK TO SEARCH FOR A PERIPHERAL TARGET
Gordon H. Robinson and Jeffrey R. Bond 15 Oct. 1975 31 p refs
(Contract N00014-75-C-0364; NR Proj. 197-028)
(AD-A016838; TR-75-21) Avail: NTIS CSCL 05/8

The dynamic patterns of eye and head movements were measured when the subject interrupted a manual control task to visually process a peripheral, digital target. The initial pattern of movement differs both quantitatively and qualitatively from that reported in 'classic' studies without the competing, central, ongoing task. A compensatory eye/head movement period was observed wherein the head began movement toward the target while fixation remained on the control task display. The initial

saccadic eye movement was delayed approximately 300 msec over the classic paradigm. Control order (plant dynamics) and control signal bandwidth have effects on this pattern as does the status of control at the time search is commanded. GRA

N76-18795# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.
EFFECT OF PROPOSED B-1 PROTECTIVE SMOKE HOOD ON VISUAL PSYCHOMOTOR PERFORMANCE Final Technical Report
Morton K. Ohlbaum and Abbott T. Kissen Aug. 1975 9 p
(AF Proj. 7222)
(AD-A015733; AMRL-TR-75-55) Avail: NTIS CSCL 06/11

Potential in-flight emergencies on contemporary aircraft include smoke in the cockpit even without patent fire. In order to avoid eye irritation, the use of a plastic hood to isolate the face of the aviator from the smoke has been proposed. Investigation of visual psychomotor performance indicates that the hood may be marginally satisfactory for very brief time periods, but completely unsatisfactory and potentially hazardous when in work for five minutes or more. Author (GRA)

N76-18796# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.
WIND TUNNEL TESTS OF A USAF FLIGHT HELMET AND LOSS PREVENTER Interim Report, Oct. 1973 - Oct. 1974
James W. Brinkley Aug. 1975 16 p ref
(AF Proj. 7231)
(AD-A015734; AMRL-TR-75-75) Avail: NTIS CSCL 06/17

An experimental effort was accomplished to measure the aerodynamic forces that act upon a crewman's flight helmet during use of an aircraft emergency escape system. Tests were accomplished within a low speed wind tunnel using volunteer subjects seated within an ACES II escape system. The wind velocity was varied to produce dynamic pressures ranging from 10 to 50 lb per sq ft. The pitch angle of the seat and subject were varied -2 to +73 degs. The yaw angle was varied from 0 to 30 degs. Author (GRA)

N76-19119* Avco-Everett Research Lab., Everett, Mass.
ELEMENTARY THEORY OF SYNCHRONOUS ARTERIO-ARTERIAL BLOOD PUMPS
Robert T. Jones, Harry E. Petscheck, and Arthur R. Kantrowitz *In* NASA. Ames Res. Center Collected Works of Robert T. Jones Feb. 1976 p 967-973
10-02)
(Contracts AF 49(638)-1657; PH-43-66-1131)
CSCL 06B

In the technique of arterio-arterial pumping, a volume of fluid is withdrawn from the aorta during systole and reinjected during diastole, thereby reducing the systolic pressure of the heart and adding energy to the systemic circulation. It is found that an upper bound for the effectiveness of such devices is given by a formula that considers stroke output of the unaided heart and the increment caused by the pump with a stroke. The division of effort of the pump between the reduction of pressure and the increase of flow depends on the physiological mechanical impedance of the heart. The total effect is, however, independent of the impedance. Author

N76-19120* Avco-Everett Research Lab., Everett, Mass.
BLOOD FLOW
Robert T. Jones *In* NASA. Ames Res. Center Collected Works of Robert T. Jones Feb. 1976 p 975-998 refs

CSCL 06P

A heuristic treatment of blood flow in the heart and the aorta together with some of the main branches considers the effects of fluid viscosity and vessel elasticity as well as pressure distribution in the typical pulsating flow. G.G.

N76-19121* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
FLUID DYNAMICS OF HEART ASSIST DEVICE
Robert T. Jones *In its* Collected Works of Robert T. Jones Feb. 1976 p 999-1017 refs Conf. paper presented at Specialists Meeting on Fluid Dynamics of Blood Circulation and Respirat. Flow, Naples, Italy, 4-6 May 1970 Sponsored in part by AFOSR

CSCL 06B

Certain hemodynamic phenomena that arise in connection with the use of artificial blood pumping devices are reviewed. Among these are: (1) Flows produced by collapsing bulbs; (2) the impedance presented by the aorta; (3) limiting velocities and instability of flow in elastic vessels; (4) effectiveness of valveless arterio-arterial pumps, and (5) wave reflection phenomena and instabilities associated with the intra-aortic balloon pump. Author

N76-19174* Martin Marietta Corp., Denver, Colo.
A MANIPULATOR ARM FOR ZERO-g SIMULATIONS
Shepard B. Brodie, Christopher Grant, and Janos J. Lazar *In* NASA. Kennedy Space Center 9th Aerospace Mech. Symp. Aug. 1975 p 19-29
CSCL 05H

A 12-ft counterbalanced Slave Manipulator Arm (SMA) was designed and fabricated to be used for resolving the questions of operational applications, capabilities, and limitations for such remote manned systems as the Payload Deployment and Retrieval Mechanism (PDRM) for the shuttle, the Free-Flying Teleoperator System, the Advanced Space Tug, and Planetary Rovers. As a developmental tool for the shuttle manipulator system (or PDRM), the SMA represents an approximate one-quarter scale working model for simulating and demonstrating payload handling, docking assistance, and satellite servicing. For the Free-Flying Teleoperator System and the Advanced Tug, the SMA provides a near full-scale developmental tool for satellite servicing, docking, and deployment/retrieval procedures, techniques, and support equipment requirements. For the Planetary Rovers, it provides an oversize developmental tool for sample handling and soil mechanics investigations. The design of the SMA was based on concepts developed for a 40-ft NASA technology arm to be used for zero-g shuttle manipulator simulations. Author

N76-19181* McDonnell-Douglas Astronautics Co., St. Louis, Mo.
THE PERFORMANCE OF COMPONENTS IN THE SKYLAB REFRIGERATION SYSTEM
Charles E. Daniher, Jr. *In* NASA. Kennedy Space Center 9th Aerospace Mech. Symp. Aug. 1975 p 115-131 refs

(Contract NAS9-6555)
CSCL 06K

The on-orbit performance of the Skylab refrigeration system components is presented. Flight anomalies are analyzed and performance of the newly developed components is described. Nine months of orbit data proved the practicality of the leak-free coolant system design. Flight proven application of a thermal capacitor and development test results of the first all-mechanical, low temperature mixing valve represent a significant advance in single-phase, low temperature coolant loop design. System flight data suggest that additional instrumentation and fluid filters could have prevented system orbit performance anomalies. Author

N76-19183* McDonnell-Douglas Astronautics Co., St. Louis, Mo.
SKYLAB TRASH AIRLOCK
Larry R. Price *In* NASA. Kennedy Space Center 9th Aerospace Mech. Symp. Aug. 1975 p 149-159

(Contract NAS9-6555)
CSCL 06K

The Skylab Trash Airlock (TAL) used throughout the Skylab mission to transfer trash materials that could support microbial

growth from the pressurized cabin to the unpressurized waste tank is described. The TAL, which uses several basic mechanisms, was successfully operated daily for the 170 days of manned missions for a total of 637 cycles. Author

N76-19190* Rensselaer Polytechnic Inst., Troy, N.Y.
MODERN MECHANISMS MAKE MANLESS MARTIAN MISSION MOBILE: SPIN-OFF SPELLS STAIRCLIMBING SELF-SUFFICIENCY FOR EARTHBOUND HANDICAPPED

George N. Sandor, David R. Hassel, and Philip F. Marino *In* NASA. Kennedy Space Center 9th Aerospace Mech. Symp. Aug. 1975 p 247-263 refs

(Grant NGL-33-018-091)
CSCL 05H

Concepts were developed for three wheel chairs from progressively improving designs of a proposed unmanned roving vehicle for the surface exploration of Mars; as a spin-off, a concept for a stair-climbing wheel chair was generated. The mechanisms employed in these are described. The Mars mission is envisioned using the booster rockets and aeroshell of the Viking missions. Author

N76-19192* National Aeronautics and Space Administration. John F. Kennedy Space Center, Cocoa Beach, Fla.
DEVELOPMENT OF A BONE-FIXATION PROSTHETIC ATTACHMENT
Lester J. Owens *In its* 9th Aerospace Mech. Symp. Aug. 1975 p 281-293
CSCL 06B

An artificial limb attached directly to the bone by a quick-disconnect coupling was tested in-place at a California medical rehabilitation center. Its design concept and development, made possible by multiple spinoffs of aerospace technology, are discussed. Author

N76-19193* Rockwell International Corp., Downey, Calif.
A UNIQUE CHALLENGE: EMERGENCY EGRESS AND LIFE SUPPORT EQUIPMENT AT KSC
Henry M. Waddell, Jr. *In* NASA. Kennedy Space Center 9th Aerospace Mech. Symp. Aug. 1975 p 295-312

CSCL 06K

As a result of the investigation following the January 1967 fire, which took the lives of three astronauts, materials were developed, flight hardware was modified, and test procedures were rewritten in order to establish the framework within which a more effective rescue concept could be developed. Topics discussed include breathing units, improved life support equipment, miniresuscitators, and hazardous tasks during space shuttle launch and landing operations. Author

N76-19778*# Kanner (Leo) Associates, Redwood City, Calif.
ON THE GEOMETRY OF THE AVIAN WING (STUDIES ON THE BIOPHYSICS AND PHYSIOLOGY OF AVIAN FLIGHT 2)
Hans Oehme and U. Kitzler Washington NASA Feb. 1976 7 p refs Transl. into ENGLISH from Zool. Jahrb. Abt. Allgem. Zool. Physiol. Tiere (Jena), v. 79, no. 3, 1975 p 402-424
(Contract NASw-2790)
(NASA-TT-F-16901) Avail: NTIS HC $3.50 CSCL 06C

The variation in chord depth along a fully extended wing was studied in 14 bird species. A model of chord depth distribution was derived. The functional and aerodynamic aspects of pinion structure were discussed. Neither the aspect ratio of the wing nor the mode of flight of the bird was clearly related to the form of the chord depth distribution. Results show that separated primaries may improve the aerodynamic properties of the wing by reducing induced drag. This applies only to large birds however results also show that a slit wing aids in generating lift. Despite external similarities in feather position, the mechanism of superated primaries in special forms of powered flight, such as hovering, is quite different, because unsteady processes dominate flow around the wing. Diagrams of the various bird wing configurations are shown. Author

N76-19779*# Scientific Translation Service, Santa Barbara, Calif.
EXPERIENCES WITH A NEW COLD STERILIZATION UNIT
W. Heiss and M. Schmidt-Mende Washington NASA Mar. 1976 11 p refs Transl. into ENGLISH from Muench. Med. Wochschr. (Munich), v. 104, no. 12, 23 Mar. 1961 p 560-562
(Contract NASw-2791)
(NASA-TT-F-16972) Avail: NTIS HC $3.50 CSCL 06B

The use of ethylene oxide for cold sterilization is discussed. The chemical and physical properties of this compound are first reviewed. Sterilization methods are then described along with applications of these methods to the sterilization of medical equipment. D.M.L.

N76-19780*# Scientific Translation Service, Santa Barbara, Calif.
A NEW COLD STERILIZATION UNIT
M. Schmidt-Mende and W. Heiss Washington NASA Mar. 1976 34 p refs Transl. into ENGLISH from Tech. Neuheiten (West Germany), v. 33, no. 1, Jan. 1962 p 40-41
(Contract NASw-2791)
(NASA-TT-F-16919) Avail: NTIS HC $4.00 CSCL 06B

The reasons for an absolutely reliable cold sterilization method are outlined. Experience with a new sterilization unit operating with ethylene oxide under tension, operating at 5.5 atmospheres and 55 C is discussed. The device can also be used for packaging infrequenly used operating room equipment in plastic bags. Author

N76-19781*# Kanner (Leo) Associates, Redwood City, Calif.
LECTURES OF ANIMAL HEAT: ON THE EFFECTS OF HEAT AND ON FEVER
Claude Bernard Washington NASA Mar. 1976 33 p refs Transl. into ENGLISH from the book "Lecons sur la Fievre: Chaleur Febrile et Sources de la Chaleur Febrile" Paris, Bailliere, 1876 Chapters 20, 21, p 405-445
(Contract NASw-2790)
(NASA-TT-F-16925) Avail: NTIS HC $4.00 CSCL 06C

Excess heat is considered to be by far the most important sympton in fever. Not only is heat distribution altered, as has been believed in the past, but also, heat production is increased. This assumption is supported by experiments on measurement of the heat radiated by the human body during fever, plus comparative studies of CO_2 exhalation, urea excretion, and weight loss between normal and febrile subjects. This excess heat may cause the death of the patient; if prolonged, it will always cause tissue degeneration. The temperature of the body is regulated by specific heat-producing and cold-producing nerves in the autonomic nervous system. The location of these nerves is studied with reference to experiments on the effects on body temperature of severance of the spinal cord at various levels. Author

N76-19782*# Organon Diagnostics, El Monte, Calif.
WATER SYSTEM VIRUS DETECTION Final Report, Jul. 1974 - Sep. 1975
A. S. Fraser, A. F. Wells, and H. J. Tenoso Nov. 1975 168 p refs
(Contract NAS9-14102)
(NASA-CR-147491; Rept-124-F) Avail: NTIS HC $6.75 CSCL 06I

A monitoring system developed to test the capability of a water recovery system to reject the passage of viruses into the recovered water is described. A nonpathogenic marker virus, bacteriophage F2, is fed into the process stream before the recovery unit and the reclaimed water is assayed for its presence. Detection of the marker virus consists of two major components, concentration and isolation of the marker virus, and detection of the marker virus. The concentration system involves adsorption of virus to cellulose acetate filters in the presence of trivalent cations and low pH with subsequent desorption of the virus using volumes of high pH buffer. The detection of the virus is performed by a passive immune agglutination test utilizing specially prepared polystyrene particles. An engineering preliminary design was performed as a parallel effort to the laboratory development of the marker virus test system. Engineering

schematics and drawings of a fully functional laboratory prototype capable of zero-G operation are presented. The instrument consists of reagent pump/metering system, reagent storage containers, a filter concentrator, an incubation/detector system, and an electronic readout and control system. Author

N76-19783*# Agnew Tech-Tran, Inc., Woodland Hills, Calif.
BACTERIAL NITRATE REDUCTASES. 8: PRELIMINARY STUDY OF THE ENZYME OF MICROCOCCUS HALODENITRIFICANS
F. Pichinoty Washington NASA Mar. 1976 11 p refs Transl. into ENGLISH from Arc. Mikrobiol. (West Germany), v. 76, 1971 p 83-90
(Contract NASw-2789)
(NASA-TT-F-16933) Avail: NTIS HC $3.50 CSCL 06M

The biochemistry of the enzyme nitrate reductase A was studied. It was prepared in the form of a crude extract from bacterial cells (by centrifugation) and appeared to be in particulate form. The effects of various salts on the enzyme were studied. It is shown that the enzyme does not have a halophilic character, and 1 or .5 M NaCl, KCL, or CsCl do not activate it. However, IM MaCl activates the reduction of nitrate to nitrite by the crude cellular extract in the prescence of lactate as an electron donor. Results indicate that this effect is not due to an action of the salt on nitrate reductase. Results also show that enzyme biosynthesis is influenced by culture conditions, as anaerobic cultures containing nitrate form approximately 7 times more enzyme than aerobic cultures not containing nitrate. J.R.T.

N76-19784# Naval Medical Research Inst., Bethesda, Md.
A HYPERBARIC, CONSTANT-TEMPERATURE GROWTH SYSTEM SUITABLE FOR CULTIVATION OF MICROORGANISMS IN GASEOUS ENVIRONMENTS PRESSURIZED TO 1000 psig Medical Research Progress Report
R. Robertson and V. Frattali Mar. 1975 18 p refs
(AD-A015627; PR-4) Avail: NTIS CSCL 06/19

A description with general construction specifications is given for a system that allows the cultivation of microorganisms in a hyperbaric environment. Although designed primarily for use with helium-oxygen gas mixtures at a maximum pressure of 1,000 psig, other gas mixtures can be utilized at the maximum or at a lower pressure. The system incorporates water bath temperature control for maintaining the internal environment of a pressure vessel at any selected temperature within the range from -5 to 50C. A number of safety features have been incorporated for protection of the system and the system operator in the event of an inadvertent overpressurization. The system has built-in flexibility to allow use of various types and sizes of microbial culture vessels, and has the capability for being easily modified to accept probes to monitor internal temperature, pH of cultivation medium, concentrations of specific gases, and other factors. GRA

N76-19785* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
THERAPEUTIC HAND EXERCISER Patent
Donald E. Barthlome, inventor (to NASA) Issued 10 Feb. 1976 7 p Filed 3 Jun. 1975 Supersedes N75-25539 (13 - 16, p 2013)
(NASA-Case-LAR-11667-1; US-Patent-3,937,215; US-Patent-Appl-SN-583487; US-Patent-Class-128-26; US-Patent-Class-128-DIG.20) Avail: US Patent Office CSCL 06B

A cyclic therapeutic hand exerciser based on inflation and deflation of structural members is described. A straightening and a bending motion is imparted to the fingers as air pressure inflates a splint-like upper member. The fingers are then straightened and upon deflation of the splint-like member and inflation of a wrist pouch a flap is tightened pulling the fingertips down and curling the fingers in toward the palm.
Official Gazette of the U.S. Patent Office

N76-19786*# Lovelace Foundation for Medical Education and Research, Albuquerque, N.Mex. Dept. of Physiology.
SPECIALIZED PHYSIOLOGICAL STUDIES IN SUPPORT OF MANNED SPACE FLIGHT Annual Research Report, 1 Jan. - 31 Dec. 1975
U. C. Luft Feb. 1976 87 p refs
(Contract NAS9-14472)
(NASA-CR-147498) Avail: NTIS HC $5.00 CSCL 06P

Subjects were tested for tolerance to lower body negative pressure (LBNP) before and after acute dehydration by working intermittenly for two hours without fluid replacement. On the second day there-after the LBNP tests were repeated before and after acute dehydration. The LBNP test consisted of 5 min long consective stages at -20, -30, -40, -50 and -60 Torr. Tests were terminated when syncope was imminent or the full sequence was completed. Tolerance was expressed in terms of cumulative stress in Torr x min. Measurements of body mass, density, fat fraction and total body water (TBW) were made before and after acclimation. Blood volume and its constituents were determined before and after each of the four LBNP tests. During LBNP, heart rate, blood pressure, and changes in calf and forearm volume were recorded every minute. Results showed: acute dehydration caused a significant loss in average LBNP tolerance on all subjects. Acclimation to heat did not significantly affect LBNP tolerance in hydrated subjects but significantly improved it on dehydrated subjects. Author

N76-19787*# Scientific Translation Service, Santa Barbara, Calif.
INFLUENCES OF FOOD AND EXERCISE ON ENDOCRINE FUNCTIONS
Hoji Suzuki and Kazuo Takebe Washington NASA Feb. 1976 30 p refs Transl. into ENGLISH from Japan. J. Clin. Pathol. (Japan), v. 22, suppl. 1, Aug. 1974 p 102-115
(Contract NASw-2791)
(NASA-TT-F-16886) Avail: NTIS HC $4.00 CSCL 06P

Eating and exercise are investigated in terms of their influence on various endocrine functions by surveying recent findings. The tests employed are described, and methods are discussed which can cope with the factors having an influence. Author

N76-19788*# Agnew Tech-Tran, Inc., Woodland Hills, Calif.
TOTAL HIP ARTHROPLASTY MADE OF SINTERED ALUMINA. EXPERIMENTAL STUDY AND FIRST CLINICAL APPLICATIONS
P. Boutin Washington NASA Feb. 1976 27 p refs Transl. into ENGLISH from Rev. Chirurgie Orthopedique Reparatrice App. Moteur (Paris), v. 58, no. 3, 1972 p 229-246
(Contract NASw-2789)
(NASA-TT-F-16864) Avail: NTIS HC $4.00 CSCL 06B

A new material for making total hip prostheses is proposed. The tolerance of dense ceramics was studied, as well as the anchorage of this material to bone. The physical, chemical, and mechanical properties of the prosthesis were evaluated. Two hundred patients have already undergone hip prosthesis surgery, but not enough time has elapsed for meaningful conclusions to be drawn. Author

N76-19789# Advisory Group for Aerospace Research and Development, Paris (France).
THE USE OF IN-FLIGHT EVALUATION FOR THE ASSESSMENT OF AIRCREW FITNESS
Chester L. Ward, ed. (Army Med. Res. and Develop. Command, Washington, D.C.) Feb. 1976 70 p refs Presented at Aerospace Med. Panel Specialists Meeting, Ankara, 24 Oct. 1975
(AGARD-CP-182; ISBN-92-835-1208-1) Avail: NTIS

Various aspects of in-flight determinations of physical, psychological, physiological and bioaeronautical suitability and fitness of aircrew are presented. These include some in-flight and simulation techniques, examination methods, bioinstrumentation and procedures for fitness studies as well as results of assessment of the ability to fly safely with orthopedic injuries, amputations, and visual deficiencies, plus a few other physiolocial and psychological situations. Also included are assessments of paratroopers and nonpilot aircrew in their performance of duty.

N76-19790 Army Medical Research and Development Command, Washington, D.C.

US ARMY. MEDICAL IN-FLIGHT EVALUATIONS, 1965-1975

Chester L. Ward, Nicholas F. Barreca (Brooke Army Med. Center, Ft. Sam Houston, Tex.), Robert J. Kreutzmann (Madigan Army Med. Center, Washington), David D. Glick (Army Aeromed. Res. Lab., Fort Rucker, Ala.), and Morris A. Shamah *In* AGARD The Use of In-Flight Evaluation for the Assessment of Aircrew Fitness Feb. 1976 10 p refs

The U.S. Army has recognized that the services of many experienced but medically disqualified aviators can be lost unless a method is established to comprehensively investigate an individual's adaptation and complete capability. Therefore one hundred thirty-two in-flight evaluations for a 10 year period (1965-1974) were reviewed. Information from the records and reports reposited at the U.S. Army Aeromedical Center, Fort Rucker, Alabama, was read, extracted and synthesized. Evaluation methods used, plus the results of compiling case classifications and the subsequent medical recommendations for duties involving flying are presented and discussed. Specific categories of individuals presented in detail are lower extremity amputees, 'one-eyed' aviators, and color vision defective aviators. Author

N76-19791 Civil Aeromedical Inst., Oklahoma City, Okla.
ACCIDENT EXPERIENCE OF CIVILIAN PILOTS WITH STATIC PHYSICAL DEFECTS

J. Robert Dille and Charles F. Booze *In* AGARD The Use of In-Flight Evaluation for the Assessment of Aircrew Fitness Feb. 1976 5 p refs

The U.S. Federal Aviation Administration (FAA) is committed to establishment of airman physical standards and certification policies that are as liberal as possible compromising aviation safety. Throught the years, medical flight results, research, and consultant opinions have resulted in relaxation of medical standards and policies and current FAA certification of 4,704 pilots with blindness or absence of one eye, 14,421 who wear contact lenses, 15,779 with deficient color vision, 15,543 with deficient distant vision and smaller, but significant, numbers with paraplegia, deafness, and amputations. Limitations are placed on flying activities when appropriate. Routine aircraft accident investigations seek to determine the presence of physical problems in the involved airmen and any probable association of the defect with the accident cause. The FAA experience with these civilian pilots who have static physical defects is examined and accident rates were calculated for several categories of pathology for comparison with the overall accident rates in general aviation activities. Three categories show significant increases in accidents: (1) blindness or absence of one eye, (2) deficient color vision with a waiver, and (3) deficient distant vision. However, these groups reported much higher median flight times than a nonaccident airman population and accident airmen without any of the pathology selected for this study. Analyses of available data prove inconclusive but increased exposure may account for most or all of the increased accidents observed for airmen with these three pathologies. None of the accidents was related to the pilots' physical condition in the reports. Statistical biomedical data are given. Author

N76-19792 Italian Air Force Medical Appeal Board, Rome.
STRESS AND PSYCHIC FUNCTIONS: OPERATIONS OF FLIGHT CREWS AND PARATROOPS DURING PARACHUTE OPERATIONS

Luigi Longo *In* AGARD The Use of In-Flight Evaluation for the Assessment of Aircrew Fitness Feb. 1976 6 p refs

Observations are presented which were made of the behavior of a considerable number of parachutists and flight crews during parachute operations. Such operations are marked by a series of phases or pre-arranged maneuvers which involve both the higher processes and simple motor mechanisms. A trained parachute officer and psychiatrist of the Italian Air Force studied the stresses which occur in the various phases and especially the involvement of the higher psychic processes. It appears that the emotive-affective complex is especially exposed to operational stress in this situation. Hypotheses are advanced on such issues as these, with special reference to the psychological content and to the effect of drill and discipline on stress. Author

N76-19793 Army Aeromedical Research Lab., Fort Rucker, Ala.
COMPARISON OF VISUAL PERFORMANCE OF MONOCULAR AND BINOCULAR AVIATORS DURING VFR HELICOPTER FLIGHT

Thomas L. Frezell and Mark A. Hofmann *In* AGARD The Use of In-Flight Evaluation for the Assessment of Aircrew Fitness Feb. 1976 9 p refs

The inflight visual performance of six binocular Army aviators and one monocular Army aviator was assessed during various maneuvers in a JUH-1H helicopter. A corneal reflection technique using both video tape and 16mm film as a recording medium was employed. Information on the use of 13 visual sectors was provided for a number of maneuvers to include normal takeoffs and landings and hovering maneuvers. The aircraft windscreen was divided into eight sectors while the side windows and chin bubbles comprise an additional four sectors. The thriteenth visual sector represents the inside cockpit area. Data presented include percentage of total time spent in each sector, average dwell time per sector transition (permutation) values. Comparison data are provided between the six binocular pilots and the monocular pilot. These data reveal that in many cases there was little difference between binocular and monocular visual activity. In addition to the objectively recorded data, information concerning monocular visual cues is presented. Author

N76-19794 Army Aeromedical Research Lab., Fort Rucker, Ala.
HELICOPTER FLIGHT PERFORMANCE WITH THE AN/PVS-5, NIGHT VISION GOGGLES

Michael G. Sanders, Kent A. Kimball, Thomas L. Frezell, and Mark A. Hofmann *In* AGARD The Use of In-Flight Evaluation for the Assessment of Aircrew Fitness Feb. 1976 15 p refs (For

Rotary wing flight at night in an instrumented UH-1H with aviators utilizing night vision goggles was studied. These devices restrict field of view, provide monochromatic imagery, and weight, and with the exception of bifocals require manual refocus to gain inside visual capability. These second generation image intensification systems were used during low level and nap-of-the-earth flight profiles in addition to various maneuver sets. Three intensification systems were compared to the unaided eye over these conditions. These systems included 40 deg field of view (FOV), 60 deg FOV and 40 deg FOV with a 30 percent bifocal cut. Over twenty aircraft state variables and aviator control inputs were measured and submitted to analysis. In addition to descriptive and univariate techniques, the data were subjected to a multiple discriminant analysis. The subjects (instructor pilots) also responded to questionnaires regarding the preference, training and estimated capabilities of each type of intensification system. The major findings of both the subjective and objective measures are summmarized. Author

N76-19795 Mainz Univ. (West Germany). Dept. of Physiology.
IN-FLIGHT LINEAR ACCELERATION AS A MEAN OF VESTIBULAR CREW EVALUATION AND HABITUATION

Rudolf J. VonBaumgarten *In* AGARD The Use of In-Flight Evaluation for the Assessment of Aircrew Fitness Feb. 1976 4 p refs

Individual differences in susceptibility to motion sickness and in man's ability to habituate to vestibular stimuli was studied. It is proposed that individually oriented programs of vestibular testing (ground based) be supplemented by specific in-flight tests and in-flight habituation training for the following reasons: (1) the stimuli which cause vestibular airsickness in high performance aircraft at the shortest latency are rectilinear accelerations (otolithic-stimuli) of amplitudes, jerkloads and frequencies which cannot be simulated on the ground without enormous technical difficulties, and (2) the conventional ways of testing for motion sickness on the ground, involving coriolis-effects on rotating chairs, swings, caloric stimulation of the ears and centrifugation, do not simulate closely enough conditions of aircraft flight. It is suggested that special vestibular in-flight test and training regimens be used, based on individual traits. The test and habituation flights should include z-Axis acceleration between -1 and +2 g's, changes of rhythm of such stimulation, and

alternation between threshold and sub-threshold maneuvers of opposite direction. Preliminary data obtained in a Lear-jet and in aerobatic light planes are examined and indicate that certain otolithic stimuli are very effective in producing motion sickness, and that habituation can be obtained against such stimuli.

Author

N76-19796 Ataturk Sanatorium, Ankara (Turkey).

EFFECT OF INCREASED ATMOSPHERIC ELECTRICITY ON THE BLOOD ELECTROLITES OF AIRPLANE CREW

Gultekin Caymaz *In* AGARD The Use of In-Flight Evaluation for the Assessment of Aircrew Fitness Feb. 1976 5 p refs

Airplane pilots during flights sometimes develop disorientation and fly in wrong directions with accidents resulting. It is proposed that the cause of disorientation or collapse in some of these cases may be the sudden changes in blood electrolites and acidity of the blood produced by increased atmospheric electricity. Experiments are described that were made on airplanes and their crews which show that the atmospheric electricity is higher inside the airplane than outside. Blood samples taken before and after flight show definite changes of acidity, electrolites and cholesterol. Atmospheric electricity was measured on a daily basis, and following high voltages, there were always increased amounts of traffic and airplane accidents. The study was conducted by the Turkish Air Force.

Author

N76-19797*# Scientific Translation Service, Santa Barbara, Calif.

RELATIONSHIP BETWEEN WHOLE BODY AND LOCAL TOLERANCE TO COLD

Nobuo Yuza Washington NASA Mar. 1976 23 p refs Transl. into ENGLISH from "Zenshin Taikansei to Kyokusho Taikansei to no Kankei", Japan Air Self Defense Force, Aeromed. Lab., Japan. Reports, Tokyo, v. 14, Dec. 1973 p 147-160

(Contract NASw-2791)

(NASA-TT-F-16911) Avail: NTIS HC $3.50 CSCL 06S

An attempt was made to clarify the relationship between whole body tolerance to moderate cold and local tolerance to extreme cold in man. Healthy adult male volunteers were subjected to cold environments naked at 25 C, 20 C and 15 C in a climatic chamber for assessing whole body cold tolerance and to a point test for the middle finger in ice water for estimating resistance against frostbite.

Author

N76-19798# Royal Aircraft Establishment, Farnborough (England).

MAXIMUM FORCES EXERTED BY MEN IN THE ZONE OF MOVEMENT OF THE ARMS AND LEGS

W. Rohmert Sep. 1975 35 p refs Transl. into ENGLISH from German report 1616

(RAE-Lib-Trans-1839; Rept-1616) Avail: NTIS HC $4.00

Maximum force measurements were carried out on five students, selected from a constitutional aspect, in the zone of movement of the arms in the six coordinate directions and for both rotational directions, as well as in the zone of movement of the legs as maximum foot forces in the plane of the symmetry of the body. The results are summarized in a biometric atlas. To illustrate, isodynes are plotted in the zone of movement. The accuracy of force measurements is discussed. In order to present the individual scatter in the position of the isodynes, the results are compared with earlier random investigations on a group of 60 students. Conclusions are drawn from the results and their practical and theoretical significance discussed.

Author

N76-19799# Advisory Group for Aerospace Research and Development, Paris (France).

SPINAL INJURY AFTER EJECTION [LESIONS VERTEBRALES APRES EJECTION]

R. Auffret (Lab. de Med. Aerospatiale du Centre d'Essais en Vol de Bretigny sur Orge, France) and R. P. Delahaye (Hopital Militaire Begin, Saint Mande, France) 1975 59 p refs In FRENCH

(AGARD-AR-72(FR)) Avail: NTIS HC $4.50

Statistical data from seven NATO countries dealing with the frequency of fatalities, spinal fractures, and their distribution following ejection from aircraft was presented and analyzed. The relevant anatomical and physiological aspects were reviewed, followed by a discussion on the pathological mechanism of fractures. In most cases, it is difficult to determine whether the spinal fractures take place during the initial ejection or during the subsequent landing. Proper positioning of the pilot on the ejector seat is an essential requirement for a successful ejection. The radiological aspects of spinal fractures were described by distinguishing between stable and unstable fractures. The subsequent treatment and disability period were described. It is recommended that, following any ejection, a radiological examination of the entire spinal column should be completed. The strict aptitude requirements set by most air forces for combat aircraft pilots were discussed.

Transl. by Y.J.A.

N76-19800# Institute for Perception RVO-TNO, Soesterberg (Netherlands).

HUMAN SENSORY FUNCTIONS. PART 1: VISUAL FUNCTIONS [ZINTUIGLIJKE FUNCTIES VAN DE MENS. DEEL 1: VISUELE FUNCTIES]

J. J. Vos 1974 35 p refs In DUTCH

(IZF-1974-24; TDCK-65450) Avail: NTIS HC $4.00

A contribution to a handbook on psychonomy relating to sensory functions is presented. The properties of the human eye are described, including optical image formation, image quality, the retina, photometry, light and dark adaptation, and color vision.

ESA

N76-19801# Interuniversitair Reactor Instituut, Delft (Netherlands).

GONAD DOSAGE IN MALES RESULTING FROM X-RAY DIAGNOSTICS [GONADENDOSES BIJ MANNEN TENGEVOLGE VAN ROENTGENDIAGNOSTIEK]

J. A. Koen and C. J. Huyskens Mar. 1975 73 p refs In DUTCH

(IRI-190-75-05) Avail: NTIS HC $4.50

The Genetically Significant Dosage (GSD) resulting from X-ray diagnostics in Dutch hospitals was investigated. The frequency distribution of the dosage per patient was determined for eight X-ray diagnostic types which together produce about 90 % of the GSD. Some 6600 tests were carried out, and an estimate of 20 mrad was obtained for GSD in males. No correlation could be made between measured gonad dosage and the technical parameters of X-ray diagnostics. Some recommendations are made for possible further studies, which should result in suggestions for dosage-limiting measures.

Author (ESA)

N76-19802# Army Medical Intelligence and Information Agency, Washington, D.C.

METHODS FOR STUDYING EFFECTS OF ENVIRONMENTAL STRESSES ON THE RESPIRATORY SYSTEM OF MAN

Pierre Varene and Henri Viellefond 6 Oct. 1975 11 p refs Transl. into ENGLISH from the book "Methodes D'Etude des Effets des Contraintes de L'Environnement sur le Systeme Respiratoire de L'Homme" France, Jan. 1973 p 469-472

(AD-A015889; MIIA-K-5925) Avail: NTIS CSCL 06/19

The report presents three stresses imposed by the environment on the thoracic-pulmonary apparatus of man. The stresses are modification of apparent weight, increase in density of ventilated gases and swift variation of ambient pressure. A detailed discussion of each stress and methods involved in determining the effects of the stresses are included.

GRA

N76-19803# Army Medical Intelligence and Information Agency, Washington, D.C.

MECHANISM OF ADAPTATION OF THE ORGANISM TO HIGH-ALTITUDE HYPOXIA AND THE PROBLEM OF PROPHYLAXIS

F. Z. Meyerson 11 Sep. 1975 15 p refs Transl. into ENGLISH from Mono. Mekhanizm Adaptatsii Organizma k Vysotnoi Gipoksii i Prob. Profilaktiki (USSR), May - Jun. 1973 p 71-15

(AD-A015887; MIIA-K-5800) Avail: NTIS CSCL 06/19

The report presents the results of a study of the synthesis of DNA, RNA and protein in the nuclei and mitochondria of the heart during the adaptation to intermittent action of hypoxia. The adaptive value of mitochondrial biogenesis in hypoxia consists

apparently in the following. The occurring oxygen deficiency lowers the formation of ATP in each mitochondrion. Accordingly, the formation of ATP per unit mass of tissue decreases as well. In response to this, there is activation in mitochondrial biogenesis, and the amount of these organelles per unit mass of tissue increases. Summing up, the functional disturbances which appear primarily as a result of ATP deficiency are abolished inspite of the persistent oxygen insufficiency and the decrease in the formation of ATP by each mitochondrion. Further development of the research concerned with studying the mechanism of adaptation to hypoxia and its prophylactic effects may apparently play its own role in the elaboration of methods of prophylaxis and treatment of heart and brain diseases. GRA

N76-19804# California Univ., San Francisco. Biomechanics Lab.

SUMMATION OF HUMAN LOCOMOTION AND RELATED STUDIES Final Report, Jan. 1972 - Jun. 1975

V. T. Inman, H. D. Eberhart, and H. J. Ralston. Sep. 1975 46 p refs Sponsored in part by HEW

(PB-245794/3; SRS-23-P-55835) Avail: NTIS HC $4.00 CSCL 06P

A major book, 'Human Walking,' summing up the work done at the Biomechanics Laboratory (and its predecessor projects) over the past 31 years, is being written. When complete, it will provide information on kinematics, including quantitative measurements of normal and abnormal gait, and kinetics, as well as energy transfers within the body, energy requirements during locomotion, the functions of the muscles, and the change that occur in certain disabilities and with loading of various parts of the body. The effects of surgical procedures and of certain appliances will be described. A monograph, 'The Joints of the Ankle,' by Verne T. Inman, is in press. This book, which deals primarily with the biomechanics of the ankle (talocrural) and subtalar (talocalcaneal) joints, rectifies many errors long perpetuated in the literature and offers pointers for clinical problems that have hitherto been inexplicable and have usually been solved on a trial-and-error basis. Author

N76-19805# Naval Medical Research Inst., Bethesda, Md.

THE VESTIBULAR APPARATUS UNDER WATER AND IN COMPRESSED GAS ENVIRONMENTS: ABSTRACTS OF TRANSLATED STUDIES Medical Research Progress Report

Robert S. Kennedy. Feb. 1975 27 p refs

(AD-A015626; PR-1) Avail: NTIS CSCL 06/19

Twenty-two studies which contribute to understanding the role of the vestibular system under water and high pressure are abstracted in this report. Several aspects of vestibular function are included (e.g. decompression sickness, pressure vertigo, diver navigation, etc.). The studies were originally published in German (in one case Russian), but have been translated into English. Copies of the full translations are available on request from the author of this report. GRA

N76-19806# National Inst. for Occupational Safety and Health, Rockville, Md.

REGISTRY OF TOXIC EFFECTS OF CHEMICAL SUBSTANCES, 1975 EDITION

H. E. Christensen, T. T. Luginbyhl, and B. Carroll. Jun. 1975 1399 p refs Prepared by Tracor Jitco, Inc., Rockville, Md.

(Contract CDC-99-74-92)

(PB-246557/3; NIOSH-TSL-75) Avail: NTIS HC $41.75 CSCL 06T

The 1975 edition of the registry of Toxic Effects of Chemical Substances, formerly known as the NIOSH Toxic Substances List, is the fifth edition prepared in compliance with the requirements of the Occupational Safety and Health Act of 1970 (PL-91-596). This registry contains toxicity information on approximately 17,000 unique chemical substances along with about 48,000 synonyms. Information is given on route of entry, toxic dose and toxic effects including an indication of existing evidence of the substance may be carcinogen, mutagen, teratogen, etc. GRA

N76-19807# Institute for Perception RVO-TNO, Soesterberg (Netherlands).

THE DEVELOPMENT OF A RASURA SELECTION TEST

C. L. Truijens. 1974 14 p refs In DUTCH; ENGLISH summary

(Contract A69/KL/095)

(IZF-1974-18; TDCK-65380) Avail: NTIS HC $3.50

A selection test was constructed in the form of a strongly abbreviated auditive Doppler radar (RASURA) training course. The duration of this test is 45 min. By way of validation this test was administered to 105 trainees from the RASURA training center, before the actual training course. The most appropriate scoring method proved to be summation of all errors made during the test. With this scoring method the test validity, i.e., the correlation between performance in training and on the test, was $r = 0.633$. Some graphs are given by means of which a feasible choice can be made of a selection percentage and a selection threshold. Author (ESA)

N76-19808# Payne, Inc., Annapolis, Md.

LOW-SPEED AERODYNAMIC FORCES AND MOMENTS ACTING ON THE HUMAN BODY Final Report, 1 Nov. 1973 - 31 Jan. 1975

Peter R. Payne. Jul. 1975 167 p refs

(Contract F33615-74-C-4015; AF Proj. 7231)

(AD-A015801; Working-Paper-119-9; AMRL-TR-75-6) Avail: NTIS CSCL 06/9

Information on the aerodynamic forces acting on the human body is sparse, and scattered in various hard-to-find reports. A primary purpose of this report is to collect the available data in one volume, and to present it in the most useful form. The aerodynamic force and moment data originally reported by Schmitt for three body positions is reported, together with additional data which he did not publish. The drag portion of the Schmitt data is then compared with all other available drag data, represented by wind tunnel tests with volunteer subjects and anthropomorphic dummies, and the instrumented free falls of parachutists and anthropomorphic dummies. GRA

N76-19809# Institute for Research, State College, Pa. Div. of Psychobiology.

BEHAVIORAL ENHANCEMENT Final Report, 1 Mar. 1973 - 31 Aug. 1975

Paul M. Hurst and Sallyann K. Bagley. 31 Aug. 1975 18 p refs

(Contract N00014-73-C-0217)

(AD-A016250) Avail: NTIS CSCL 05/10

The principal goal in this 30-month period was to facilitate voluntary control over sleep. The initial phase employed analog tonal biofeedback of integrated submental EMG potential to facilitate relaxation. A pilot study was conducted in which EEG-determined Stage 2 sleep latency was compared within subjects between 'tone on' and 'tone off' conditions. This was followed by a controlled study in which one group of subjects received tonal biofeedback and the other did not. Neither study indicated any beneficial results from biofeedback on either relaxation or sleep latency. A third study was conducted in which a sedative-hypnotic drug (flurazepam) was used to evoke sleep in the attempt to achieve voluntary control of a classically conditioned response. Comparison of post-drug with pre-drug trials reveals a more rapid facilitation of sleep onset than would be expected on the basis of practice along, but does not conclusively demonstrate that classical conditioning was responsible. GRA

N76-19810# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Systems and Logistics.

A COMPARATIVE ANALYSIS OF LEADERSHIP STYLES EXISTING IN SYSTEM PROGRAM OFFICES IN DIFFERENT PHASES OF THE WEAPON SYSTEM ACQUISITION LIFE CYCLE M.S. Thesis

Jerry W. Coggeshall and Juan G. Jasso. Aug. 1975 119 p refs

(AD-A016265; SLSR-6-75B) Avail: NTIS CSCL 05/10

The leadership styles of managers and specialists working in United States Air Force weapon system program offices were

examined in terms of the phases of the weapon system acquisition life cycle. The research population consisted of military and civilian managers and specialists working in thirteen weapon system program offices, each identified with a particular phase of the weapon system acquisition life cycle. For purposes of comparison, phases of the weapon system acquisition life cycle were grouped into conceptual/validation, full-scale development, and production/deployment categories. The Leadership Opinion Questionaire (LOQ), which measures leadership dimensions of consideration and structure, was the instrument through which data were obtained. Statistical analyses were based upon the LOQ scores of 182 respondents from the three categories: conceptual/validation - 22; full-scale development - 80; and production/deployment - 80. GRA

N76-19811# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Systems and Logistics.
A COMPARATIVE ANALYSIS OF ORGANIZATIONAL CLIMATE EXISTING IN SYSTEM PROGRAM OFFICES IN DIFFERENT PHASES OF THE WEAPON SYSTEM ACQUISITION PROCESS M.S. Thesis
Julius C. Larson, Jr. and Peter J. Ruppert Aug. 1975 114 p refs
(AD-A016261; SLSR-1-75B) Avail: NTIS CSCL 05/10

Organizational climate is a relatively new concept that has come upon the social research scene. It can be conceptualized as the sum of all the different perceptions individuals in an organization have with respect to the organization. This study attempted to measure and assess the prevailing organizational climate in System Program Offices (SPOs) in different phases of the weapon system acquisition process. The researchers were interested in determining if organizational climate differed in different phases of weapon system acquisition. GRA

N76-19812# Georgia Inst. of Tech., Atlanta. School of Industrial and Systems Engineering.
QUANTITATIVE MODELLING OF THE TIME-MULTIPLEXING CHARACTERISTICS OF HUMAN CONTROLLERS Final Report
Tarald O. Kvalseth Aug. 1975 91 p refs
(Grant NSF GK-37419)
(PB-246339/6) Avail: NTIS HC $5.00 CSCL 05H

Theoretical model formulations and experimental data are presented for the input sampling or time-multiplexing characteristics of the human operator. An analysis is made of the uncertainty structure and the information processing during the sampling process; comparisons are made between the subjective and the objective uncertainty between sampling points. The effect of the cost structure on the sampling behavior was studied and an optimal dynamic sampling model was developed and tested. Studies one, two, and four involve pure monitoring tasks while the third one is based on a closed-loop control task. The displayed signals are all digital. GRA

N76-19813*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
HIGH PRESSURE SPACE SUIT ASSEMBLY
Hubert C. Vykukal and Bruce W. Webbon Dec. 1975 20 p
(NASA-TM-X-62515; A-6393) Avail: NTIS HC $3.50 CSCL 06K

An effort is underway to incorporate advanced suit and LSS components into a functional suit in order to assess the performance of these components. A brief description of the suit configuration is presented. Author

N76-19814*# Transemantics, Inc., Washington, D.C.
SPACE PHARMACY
I. Fedorov NASA Mar. 1976 5 p Transl. into ENGLISH from Aviatsiya i Kosmonavtika (USSR), no. 1, Jan. 1976 p 30
(Contract NASw-2792)
(NASA-TT-F-16964) Avail: NTIS HC $3.50 CSCL 06E

Functional disorders and illnesses which could occur during space flight are considered in terms of preparation of a first-aid kit. Contents of the kit are discussed as well as instructions and training in the use of the kit. Author

N76-19815*# Nelson and Johnson Engineering, Inc., Boulder, Colo.
CONCEPT DESIGN AND ALTERNATE ARRANGEMENTS OF ORBITER MID-DECK HABITABILITY FEATURES Final Report
Russell A. Church, John A. Ciciora, Kenneth L. Porter, and Grant E. Stevenson 30 Jan. 1976 210 p refs
(Contract NAS9-14686)
(NASA-CR-147495) Avail: NTIS HC $7.75 CSCL 05E

The evaluations and recommendations for habitability features in the space shuttle orbiter mid-deck are summarized. The orbiter mission plans, the mid-deck dimensions and baseline arrangements along with crew compliments and typical activities were defined. Female and male anthropometric data based on zero-g operations were also defined. Evaluations of baseline and alternate feasible concepts provided several recommendations which are discussed. Author

N76-19816*# National Aeronautics and Space Administration. John F. Kennedy Space Center, Cocoa Beach, Fla.
PERCUTANEOUS CONNECTOR DEVICE Patent Application
Walter E. Parsons, inventor (to NASA) Filed 16 Sep. 1975 17 p
(NASA-Case-KSC-10849-1; US-Patent-Appl-SN-613734) Avail: NTIS HC $3.50 CSCL 06B

A percutaneous connector device for facilitating the passage of electrical signals from an external source through the skin of a patient to internal portions of the body such as muscles and nerves is described. The connector device includes a bio-compatible shell having an enlarged disk shaped portion for being implanted below the skin of the patient. The shell has a first and second electrically conductive post upon which a plug means can be readily connected and disconnected. A modified form of the invention utilizes a unipolar connector that is adapted to be plugged into a shell implanted below the skin of a patient. Both of the connector devices are designed so as to be separated when a predetermined force is applied to the implanted bio-compatible shell. NASA

N76-19817# Systems Technology, Inc., Hawthorne, Calif.
MODELING BIODYNAMIC EFFECTS OF VIBRATION Interim Scientific Report
R. E. Magdaleno and R. W. Allen Jul. 1975 26 p refs
(Contract F44620-73-C-0075; AF Proj. 9777)
(AD-A015901; STI-TR-1037-2; AFOSR-75-1236TR) Avail: NTIS CSCL 06/19

Research during the year included refinement of a General Frequency Model Identification (GERMID) program so as to efficiently fit structural model parameters to data. Structural model refinements including a detailed neuromuscular actuation system model form based on applying the GERMID parameter identification program to some direct neuromuscular system describing function data previously gathered was initiated. Head motion data was reduced, interpreted and compared with head and eye motion data from the literature. Thus during the past two years the investigators have been engaged in determining the basic mechanisms of and models for vibration interference in pilot control tasks. Efforts in the next year will be to simplify some aspects of these component effects models and combine both visual and motor remnant models to give an overall performance model. GRA

N76-19818# Pennsylvania State Univ., University Park. Center for Air Environment Studies.
INFLUENCE OF ALTERED GASEOUS ENVIRONMENTS ON LUNG METABOLISM Annual Interim Progress Report, 1 Jul. 1974 - 30 Jun. 1975
Rodney A. Rhoades Jul. 1975 37 p refs
(Grant AF-AFOSR-2767-75; AF Proj. 9777)
(AD-A015914; AFOSR-75-1272TR) Avail: NTIS CSCL 06/19

The findings from this investigation indicated that 24h in vivo exposure to hyperoxia (100% oxygen) did not alter lung lipid synthesis but did alter lactate production and pyruvate metabolism. In vitro perfusion of lungs for 1.5h showed that direct exposure of lung to altered carbon dioxide tension does

not produce edema. Moreover, direct exposure to altered carbon dioxide tension did not alter lipid synthetic capacity. Both lactate and pyruvate metabolism was altered with hypocapnia, while hypercapnia affected only pyruvate metabolism. Twenty four hour hypoxia significantly altered lung cyclic nucleotide levels. These data indicate that altered gaseous environments significantly change certain aspects of lung cellular activity and that changes in lactate and pyruvate metabolites may serve as sensitive indicators to lung dosage.

GRA

PUBLIC COLLECTIONS OF NASA DOCUMENTS

DOMESTIC

NASA distributes its technical documents and bibliographic tools to ten special libraries located in the organizations listed below. Each library is prepared to furnish the public such services as reference assistance, interlibrary loans, photocopy service, and assistance in obtaining copies of NASA documents for retention.

CALIFORNIA
University of California, Berkeley
COLORADO
University of Colorado, Boulder
DISTRICT OF COLUMBIA
Library of Congress
GEORGIA
Georgia Institute of Technology, Atlanta
ILLINOIS
The John Crerar Library, Chicago
MASSACHUSETTS
Massachusetts Institute of Technology, Cambridge
MISSOURI
Linda Hall Library, Kansas City
NEW YORK
Columbia University, New York
PENNSYLVANIA
Carnegie Library of Pittsburgh
WASHINGTON
University of Washington, Seattle

NASA publications (those indicated by an "*" following the accession number) are also received by the following public and free libraries:

CALIFORNIA
Los Angeles Public Library
San Diego Public Library
COLORADO
Denver Public Library
CONNECTICUT
Hartford Public Library
MARYLAND
Enoch Pratt Free Library, Baltimore
MASSACHUSETTS
Boston Public Library
MICHIGAN
Detroit Public Library
MINNESOTA
Minneapolis Public Library
MISSOURI
Kansas City Public Library
St. Louis Public Library
NEW JERSEY
Trenton Public Library
NEW YORK
Brooklyn Public Library
Buffalo and Erie County Public Library
Rochester Public Library
New York Public Library
OHIO
Akron Public Library
Cincinnati Public Library
Cleveland Public Library
Dayton Public Library
Toledo Public Library
OKLAHOMA
Oklahoma County Libraries, Oklahoma City
TENNESSEE
Memphis Public Library
TEXAS
Dallas Public Library
Fort Worth Public Library
WASHINGTON
Seattle Public Library
WISCONSIN
Milwaukee Public Library

An extensive collection of NASA and NASA-sponsored documents and aerospace publications available to the public for reference purposes is maintained by the American Institute of Aeronautics and Astronautics, Technical Information Service, 750 Third Avenue, New York, New York, 10017.

EUROPEAN

An extensive collection of NASA and NASA-sponsored publications is maintained by the British Library Lending Division, Boston Spa, Wetherby, Yorkshire, England. By virtue of arrangements other than with NASA, the British Library Lending Division also has available many of the non-NASA publications cited in *STAR*. European requesters may purchase facsimile copy or microfiche of NASA and NASA-sponsored documents, those identified by both the symbols "#" and "*", from: ESRO/ELDO Space Documentation Service, European Space Research Organization, 114, av. Charles de Gaulle, 92-Neuilly-sur-Seine, France.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
WASHINGTON, D.C. 20546

OFFICIAL BUSINESS
PENALTY FOR PRIVATE USE $300

SPECIAL FOURTH CLASS MAIL

POSTAGE AND FEES PAID
NATIONAL AERONAUTICS AND
SPACE ADMINISTRATION
NASA-451

U.S. MAIL

612 1 SP-7011 760625 S00606HU
UNIV OF MICHIGAN
ENGINEERING LIBRARY
ATTN: MR ROBERT T FREESE
ANN ARBOR MI 48104

POSTMASTER: If Undeliverable (Section 158 Postal Manual) Do Not Return

NASA CONTINUING BIBLIOGRAPHY SERIES

NUMBER	TITLE	FREQUENCY
NASA SP-7011	AEROSPACE MEDICINE AND BIOLOGY Aviation medicine, space medicine, and space biology	Monthly
NASA SP-7037	AERONAUTICAL ENGINEERING Engineering, design, and operation of aircraft and aircraft components	Monthly
NASA SP-7039	NASA PATENT ABSTRACTS BIBLIOGRAPHY NASA patents and applications for patent	Semiannually
NASA SP-7041	EARTH RESOURCES Remote sensing of earth resources by aircraft and spacecraft	Quarterly
NASA SP-7043	ENERGY Energy sources, solar energy, energy conversion, transport, and storage	Quarterly
NASA SP-7500	MANAGEMENT Program, contract, and personnel management, and management techniques	Annually

Details on the availability of these publications may be obtained from:

SCIENTIFIC AND TECHNICAL INFORMATION OFFICE

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

Washington, D.C. 20546